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IDAHO
DEPARTMENT OF FISH AND GAME

Jerry M. .Conley, Director

FEDERAL AID IN FISH AND WILDLIFE RESTORATION

Job Performance Report

Project F-71-R-10

REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

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Job 6(SAL)-b. Salmon Subregion Lowland Lake Investigations
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by

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May 1987

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JOB PERFORMANCE REPORT

State of: Idaho Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-10 Title: Region 6 Salmon Subregion
Job No.: 6(SAL)-a Mountain Lakes Investigations

Period Covered: July 1, 1985 - June 30, 1986

ABSTRACT

No mountain lakes were surveyed on the ground in 1985.

A helicopter was used to stock 33,000 trout fry in 64 mountain lakes in the Sawtooth Mountains (Sawtooth National Recreation Area) and in the Challis National Forest in 1985. The advantages and techniques of this method are described.

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TECHNIQUES

Photocopies were made of the areas to be stocked from 1/2 in/mi USFS maps and a flight plan was outlined. Detailed maps were also photocopied from 2 in/mi planametric maps and the flight route, numbers of fish and species to be stocked were noted on these. A list of lakes accompanied these maps in a sequential stocking order.

Three-gal plastic milk bags containing 1 gal of water, 250 to 1,000 trout fry (at approximately 1,000 lb) and inflated with pure oxygen were loaded into the helicopter in reverse order to their stocking sequence. Each bag was labeled with a marking pen as to the species and number of fish.

The pilot, navigator and one or two fish stocking crew members flew the designated flight route following the maps, utilizing the planametric maps to recognize specific individual lakes. The helicopter hovered over each lake as a crew member cut a corner off the designated bag and released the fry Into the lake. The navigator then used the maps to direct the craft to the next lake.

RESULTS AND DISCUSSION

The use of a helicopter, coupled with detailed maps and a navigator, has proved to be an efficient, accurate method of stocking mountain lakes in rugged, remote and navigationally confusing areas. The flight plan economizes air time, details the most efficient route and assists greatly in locating hard-to-find lakes or a few specific lakes among a large group. Planametric maps, large scale maps keyed to water and drainage features, are detailed navigational aids that accurately depict the shape of each lake and are invaluable in picking out specific bodies of water in large mountain lake groups. By using this map method, the possibility of stocking error is considerably reduced, air time spent looking for lakes in confusing terrain is minimized and personnel unfamiliar with the area can accomplish the stocking procedure in an efficient, accurate manner.

The use of the helicopter allows a visual examination of the mountain lakes being stocked, including the presence of inlet and/or outlet streams and spawning potential, water level fluctuations, excessive shallowness, the presence of fish from earlier plantings and provides an opportunity for taking aerial view photographs. It also guarantees better accuracy for placing fish into the water than fixed-wing aircraft.

The fishery manager can also take advantage of the total flight to visualize drainage relationships and locate and note terrestrial activities.

The list of mountain lakes stocked by helicopter in 1985 is shown in Table 1.

Table 1. Mountain lake plants, 1985.

Lake	Species stocked	Number stocked
Martha (Elk Creek)	CT	250
Hidden	CT	500
Elizabeth	CT	500
Hanson Lake #1	CT	500
Hanson Lake #2	CT	1,000
Hanson Lake #3	RB	500
McGowan #2	RB	500
McGowan #3	RB	500
Iron Creek #7	CT	500
Goat Creek #2	CT	1,000
Goat Creek #4	CT	500
Goat Creek #5	CT	250
Goat Creek #6	CT	250
Marshall #2	CT	500
Fishhook Creek #1	CT	250
Fishhook Creek #2	CT	250
Upper Redfish #1	CT	500
Upper Redfish #2	CT	500
Decker #1	CT	500
McDonald #2	CT	500
Hell Roaring #15 (Profile)	CT	500
Hell Roaring #14 (Lucille)	CT	500
Imogene #1	RB	2,000
Imogene #2	CT	500
Imogene #3	CT	500
Imogene #4	CT	250
Imogene #5	CT	250
Imogene #6	CT	250
Alpine Creek Lake #12	CT	250
Alpine Creek Lake #11	CT	500
Alpine Creek Lake #10	CT	250
Alpine Creek Lake # 9	CT	250
Alpine Creek Lake # 8	CT	250
Alpine Creek Lake # 7	CT	500
Alpine Creek Lake # 6	CT	500
Alpine Creek Lake # 5	CT	500
Alpine Creek Lake # 4	CT	1,000
Alpine Creek Lake # 3	CT	500
Alpine Creek Lake # 2	CT	250
Cabin Creek Peak #3	CT	500
Cabin Creek Peak #4	CT	500
Cabin Creek Peak #5	CT	500
Cabin Creek Peak #6	CT	500
Cabin Creek Peak #7	CT	750

Table 1. Continued.

Lake	Species stocked	Number stocked
Tango #5	CT	750
Tango #3	CT	750
Loon Creek #10	CT	500
Loon Creek #11	CT	500
Loon Creek #12	CT	500
Loon Creek #13	CT	1,000
Kidney #2	RB	500
Cliff Creek #1	CT	500
Vanity # 3	CT	750
Vanity # 5	CT	250
Vanity # 8	CT	250
Vanity #13	CT	500
Harlan #1	CT	500
Harlan #2	CT	500
Hasbrook #1	CT	750
Iris #13	RB	500
S. Fork Fall Creek #13	RB	500
F-82	CT	500
Lola Creek #2	CT	500
Lola Creek #3	CT	500

JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-10
Job No.: 6(SAL)-b

Title: Region 6 Salmon Subregion Lowland Lakes Investigations

Period Covered: July 1, 1985 - June 30, 1986

ABSTRACT

Williams Lake

Approximately 5,961 anglers fished on Williams Lake during the ice fishery and general fishing season combined. An estimated 12,710 rainbow trout and bull trout (1%) were harvested from Williams Lake during the period of creel survey. Angler hours were estimated to be 17,292, and the overall catch rate was 0.7 fish/hr. Over 90% of the fishing effort, harvest and number of anglers for the combined fishery occurred during the General season. Spawner counts as high as 225 fish were seen in Lake Creek. Redd counts were attempted, but they were so numerous that superimposition made accurate counts impossible.

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INTRODUCTION

Williams Lake, a mesotrophic lake, is located in northcentral Lemhi County at 1600 m (5252 ft) elevation. The surface area is 72.8 hectares (180 acres) and it is 56 m (185 ft) at the deepest with a mean depth of 23 m (75 ft). Formation of the lake occurred approximately 6,000 years ago when a landslide, probably triggered by an earthquake, blocked Lake Creek, the main source of water. Additional sources of water include one small spring and several intermittent streams.

Access to the lake prior to 1951 was by foot or horseback. In 1951, a toll road was constructed and development of the privately owned eastern one-third of the lake began with a resort, followed by private residences. In 1968, because of public demand, the U.S. Forest Service built a road into the western two-thirds of the lake, which is contained in the Salmon National Forest.

Rainbow trout (Salmo gairdneri) and bull trout (Salvelinus confluentus) originally occurred in Lake Creek prior to formation of the lake. A decline in ages and length of trout in the lake between 1958 and 1965 was documented (Bjornn 1967). Supplemental stocking of fingerling and catchable rainbow trout was initiated in 1966. Fishing pressure has diminished over the last 15 years. In 1976, a 30-day ice fishing season was established in Williams Lake, January 15 to February 15.

In 1979, a spring spawning hatchery stock of rainbow trout from Mount Whitney Hatchery, California, was introduced into Williams Lake. As a result, a self-sustaining, naturally spawning population has developed. In 1983, Lake Creek was surveyed in May, and many large rainbow trout were observed spawning. Lake Creek was closed to fishing until July 1 to protect the extremely vulnerable spawning fish. Large numbers of resultant fry indicated that supplemental stocking of rainbow trout could be discontinued.

In recent years there has been growing concern about the water quality in Williams Lake and how this might affect the fish population. Bjornn (1967) collected data on water chemistry and various limnetic parameters in Williams Lake. The largest concern developed over the relative limited area available to trout. Bjornn reported that most of the fish were concentrated in the top 9 m (20 ft) of the water column due to low levels of dissolved oxygen below 9 m. In 1979 and 1980, the Division of Environment collected data on the water quality in Williams Lake (Perry 1981), but further investigation is necessary. Beginning in 1986, the Division of Environment will begin a comprehensive investigation of Williams Lake and the entire Lake Creek drainage to try and pinpoint the sources of nutrients (e.g., phosphorus and nitrogen) that cause blooms of undesirable algae. The Department of Fish and Game will provide any assistance required.

OBJECTIVES

1. How much fishing pressure and harvest is occurring in Williams Lake?

2. What effect is this pressure having on the spawning population?

3. Will this population be able to withstand the fishing pressure without the resumption of supplemental stocking?

RECOMMENDATIONS

Continue to monitor the ice fishery for catch rate, species harvested and lengths of fish creeled. Conduct a creel survey on opening day of the general fishing season.

Maintain closure on Lake Creek above Williams Lake and conduct spawning ground surveys. Assist the Division of Environment with Williams Lake water quality study.

METHODS

The last Williams Lake creel survey was conducted by Ted Bjornn (1967), excluding creel checks conducted on opening day of the general fishing season and creel checks conducted during the ice fishing season. The first objective will be addressed by conducting a stratified random creel survey pertaining to fishing pressure, harvest, catch rate, number of anglers and length of fishing trips on Williams Lake during the 1985 ice fishery and general fishing season.

Winter Creel Survey

The winter creel survey was divided into two strata, week days and weekend days. Both weekend days were surveyed, and two randomly chosen weekdays were surveyed. The length of the fishing day was assumed to be six hours. Four angler counts per day were conducted during the intervals beginning at 1000 hours. Angler interviews were conducted during the intervals between counts. Data collected included: number of anglers; hours fished; number, length and species of fish harvested; and completed trips. For the purpose of data calculation, opening day, holidays and closing day data were tabulated independently of the remaining data.

General Fishing Season Creel Survey

The summer creel survey format varied slightly from the winter creel survey. The fishing day was assumed to be a constant 12 hr. Survey days were divided into two strata, weekdays and weekend days-holidays. One weekend day and one weekday were randomly selected for the first week. In successive weeks, weekend days alternated and the weekday alternated with a 5-week period. These days were further stratified into morning or afternoon counts. Angler counts were made at 2-hr intervals; morning counts began at 0800 hr and afternoon counts began at 1400 hr. Angler interviews were conducted between angler counts. Data collected included: number of anglers; hours fished; number, length and species of fish creeled; and completed trips. Estimates for total effort, total harvest, catch rate and total numbers of anglers for both shore and boat anglers were computed.

Spawning Ground Surveys

Spawning ground surveys were conducted once a week during May. Number of spawners and number of redds were tabulated. This data will be maintained to monitor trends in the spawning population from Williams Lake.

RESULTS

Approximately 5,961 anglers fished on Williams Lake during the ice fishery and general season combined (Table 1). An estimated 12,710 rainbow trout and bull trout (1%) were harvested from Williams Lake during the ice fishery and from May 25 through September 2, 1985. Angler hours were estimated to be 17,292, and the overall catch rate was 0.7 fish/hr. The summer fishery contributed over 90% of the effort, harvest and number of anglers for the combined fishery (Table 1).

Winter Creel Survey

The 1985 ice fishing season on Williams Lake lasted 30 days, January 15 to February 15. A total of 412 anglers expended 1,460 hr and harvested 470 fish at a catch rate of 0.32 fish/hr (Table 2). Weekdays provided the highest percentage of effort (66%) and the highest percentage of the catch (51%), but the highest catch rate occurred on opening day (0.57 fish/hr) (Table 2). There were 63 completed trip interviews, 143 anglers, average length of trip was 7 hr and the average number of fish caught/completed trip was 3.1. Rainbow trout comprised 100% of the harvest; their mean total length was 290 mm (n = 260 and range 228-420 mm). Fish 255 mm (10 in) in total length were the most abundant size group harvested (Fig. 1).

Table 1. Numbers of shore anglers, boat anglers and winter anglers in the Williams Lake fishery, 1985.

Angler component	Total # anglers		Total hours fished		Total harvest	
	Total	%	Total	%	Total	%
Winter	412	7	1,459	8	470	4
Shore	2,148	36	6,631	38	4,104	32
Boat	3,401	57	9,202	54	8,136	64
Combined	5,961		17,292		12,710	

General Fishing Season Creel Survey

The general fishing season creel survey was conducted on Williams Lake from May 25 to September 2, 1985. An estimated 5,549 anglers expended about 15,833 hours and harvested approximately 12,240 fish for a catch rate of 0.8 fish/hr (Table 3). Boat anglers expended 58% of the effort and harvested 66% of the fish (Table 4). The highest effort (5,834 hr or 37%) occurred in June; the best catch rate occurred in July (1.0 fish/hr) (Table 5). There were 54 completed trip interviews; 50% were boat anglers and 50% were shore anglers. A total of 130 anglers were interviewed. Mean length of completed trip was 7.0 hr and the average number of fish caught/completed trip was 6.2. The number of fish caught/angler was 2.6 fish/trip. Rainbow trout comprised 99% of the catch (bull trout 1%). Mean total length of harvested rainbow trout was 302 mm (n = 860 and range 203 to 483 mm). The most abundant length group was 279 mm (II in) (Fig. 2).

Spawning Ground Surveys

Spawning ground surveys were conducted in Lake Creek, the only permanent tributary to Williams Lake. The lower 0.8 km (0.5 mi) was surveyed. Spawner counts as high as 225 fish were seen. Redd counts were made from May to June, but by late June the number of redds were so numerous that superimposition made definition of individual redds impossible (Table 6). We estimate that several thousand spawners constructed many hundreds of redds the length of Lake Creek in 1985. Observations for fry were made in August. Every pool, side eddy and small holding area in Lake Creek contained visible rainbow fry. Natural production was apparently very high.

Table 2. Williams'Lake ice fishery creel data estimates, 1985.

	# anglers Hour	Angler hours Day	Angler hours Trip	Total hours	Catch Rate (Fish/ hr.)	Harvest total	Number anglers	Harvest (Fish/ ha.)
Weekdays	7.6	45.6	4.0	957.5	0.25	239	239	3.3
Weekends	7.0	42.0	2.7	336.0	0.41	137	124	1.9
Special Days[a]	9.0	54.0	3.4	165.5	0.57	92	49	1.3
Total				1,459.0	0.32	468	412	6.4

[a]Special days include opening weekend, Fourth of July and Labor Day.

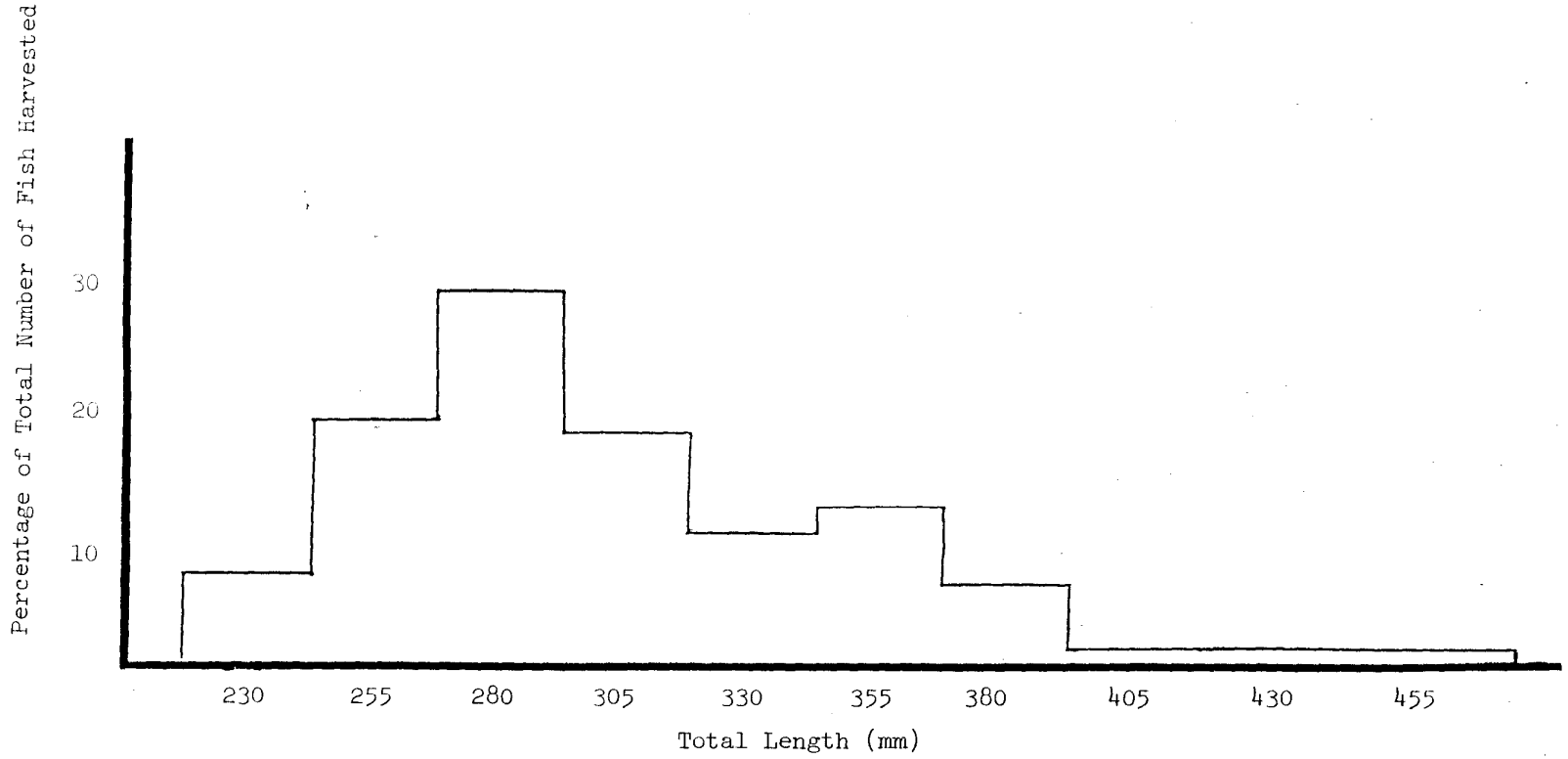

Figure 2. Length-frequency of rainbow trout harvested from Williams Lake from May 25-September 2, 1985.

Table 3. Williams Lake general fishing season creel survey estimates, includes shore anglers and boat anglers, 1985.

	# anglers hour	Angler hours day	Angler hours trip	Total hours	Catch rate (Fish/ hr.)	Harvest total	Number anglers	Harvest (Fish/ ha.)
Weekdays	4.5	54.2	2.3	6,906	0.7	4,858	3,159	66.7
Weekends	8.5	102.0	2.5	5,649	0.8	4,470	2,390	61.4
Opening Weekend	84.3	1,012.0		3,035	0.9	2,718		37.3
July 4th	14.7	176.0		176	0.9	153		2.1
Labor Day	5.6	67.2		67	0.6	41		0.5
Total				15,833	0.8	12,240		168.1

Table 4. Summary of harvest and effort for general fishing season creel survey on Williams Lake, 1985.

		Harvest		Effort (hr.)		Catch rate
		Total		Total		
Boats	Weekdays	3,264	27	4,037	25	0.81
	Weekends	2,781	23	3,035	19	0.92
	Special days[a]	2,091	17	2,130	13	0.98
	Subtotal	8,136	66	9,202	58	0.88
Shore	Weekdays	1,594	13	2,869	18	0.56
	Weekends	1,689	14	2,614	17	0.65
	Special days	821	7	1,148	7	0.72
	Subtotal	4,104	34	6,631	42	0.62
Combined Total		12,240		15,833		0.77

[a]Special days include opening weekend, Fourth of July and Labor Day.

Table 5. Summary of creel data estimates for Williams Lake from May 25 – September 2, 1985.

Month	Type of angler	# angler/hr.		# boats/hr.		Mean # anglers/ boat		Angler hr./ day		Catch rate		Total hours		Total harvest	
		WE	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE	WD	WE	WD
May/June	Boat	19.7	5.3	7.3	2.3	2.7	2.3	236	63.6	0.9	0.8	2,128	1,222	1,915.2	978 -
	Shore	13.5	4	-	-	-	-	162	36	0.6	0.6	1,620	864	972	518
Combined Totals										0.8		5,834		4,383	
July	Boat	5.8	4.6	2.3	3.2	2	18	55.2	69.6	1.0	1.2	496.8	1,600.8	497	1,921
	Shore	5.1	4.3	-	--	-	-	61.2	51.6	0.9	0.7	550.8	1,186.8	496	830
Combined Totals										1.0		3,835		3,744	
August	Boat	3.8	4.6	1.9	1.9	2	2.4	45.6	55.2	0.9	0.3	410.4	1,214.4	369	365
	Shore	4.1	3.1	-	-	-	-	49.2	37.2	0.5	0.3	442.8	818.4	221	246
Combined Totals										0.4		2,886		1,201	
May 25, 26, 27 Opening	Boat	55		23.9		2.3		660		1.0		1,980		1,980	
	Shore	29.3		-		-		351.6		0.7		1,054.8		738	
4th of July	Boat	9.9		3.3		3		118.8		0.8		118.8		95	
	Shore	4.8		-		---		57.6		1.0		57.6		58	
Labor Day	Boat	2.6		1.3		2		31.2		0.5		31.2		16	
	Shore	3		-		-		38		0.7		36		25	

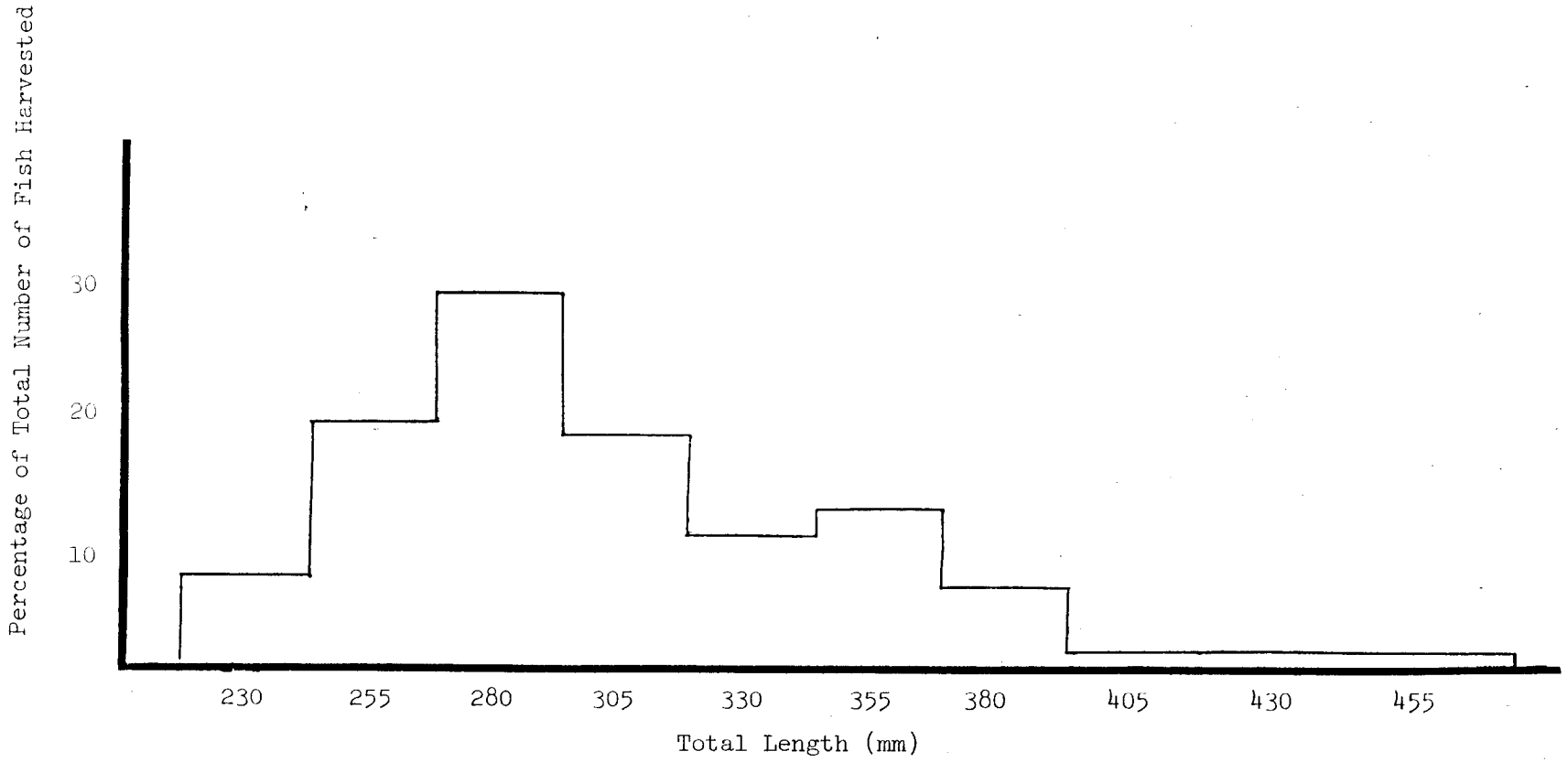

Figure 2. Length-frequency of rainbow trout harvested from Williams Lake from May 25-September 2, 1985.

Table 6. Lake Creek spawning ground survey summary, 1985.

Date	# redds	# spawners
5-01	3	2
5-10	7	6
5-15	n.c.	100
5-27	200	12
5-30	n.c.	100
6-05	Superimposed	225
6-24	Superimposed	20

DISCUSSION

The last complete creel survey for Williams Lake was conducted In 1965 by Bjornn (1967). An estimated 6,000 anglers fished for 25,360 hr and harvested 35,466 rainbow trout at a rate of 1.4 fish/hr for the period of May 31 through September 5, 1965. In 1985, the total number of anglers was 93% of the 1965 total. Fishing pressure, total harvest and catch rate declined by 38%, 65% and 43%, respectively, since the 1965 creel survey.

Sometimes it may become necessary to alter bag limits to enhance a fishery. In the case of Williams Lake, the number of fish caught/angler/completed trip was 2.6 and 3.1 for the general season and ice fishery, respectively. Because these values are far below the state limit of 6 trout, a change in bag limits would not alter the fishery.

A more recent comparison of opening weekend creel data indicated that the number of anglers had declined since 1981, total hours fished have declined and catch rates have increased since 1982 (Table 7). Mean length of fish harvested have ranged from a high in 1982 of-333 mm to a low of 272 mm in 1983 (1985 was 287 mm).

The Williams Lake ice fishery has varied over the past five years (Table 8). Total hours of interviewed anglers have ranged from 220 to 691 hr. Catch rate has varied from a high of 1.2 fish/hr in 1983 to a low of 0.34 fish/hr in 1981. Rainbow trout contributed to the majority of fish in the creel, and mean total length has been 280 mm (11 in).

This was the first year that a systematic count was made on Lake Creek spawning grounds. In 1984 an estimated 3,000 to 5,000 spawners used Lake Creek. As long as this population of rainbow trout recruit enough fry into the fishery (fish recruit to the fishery between 200 to 225 mm) to meet demands, supplemental stocking will not be necessary.

Table 7. Opening weekend creel data summary for Williams Lake, 1981-1985.

Year	Number anglers	Effort (hour)	# rainbow harvested	# bull trout harvested	Catch rate (Fish/hr.)	Mean length (mm)
1981	401	853	656	2	0.77	312
1982	317	822	273	8	0.34	333
1983	202	487	310	1	0.64	272
1984	204	419	499	6	1.2	284
1985	181	510	433	2	0.85	287

Table 8. Summary of angler interviews for Williams Lake ice fishery, 1981-1985.

Year	# anglers interviewed	Total hours fished	# fish harvested	Catch rate (Fish/hr.)	Mean length
1981	148	333	114	0.34	284
1982	130	360	227	0.63	280
1983	89	275	156	1.2	286
1984	95	219	207	0.94	280
1985	212	691	283	0.41	290

LITERATURE CITED

Bjornn, S.R. 1967. Tests for increasing the returns to hatchery trout. Job completion report, project F-32-R-8, Job 6: Williams Lake Fisheries Investigations. Idaho Department of Fish and Game. Boise. 33pp.

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JOB PERFORMANCE REPORT

State of: Idaho Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-10 Title: Region 6 Salmon Subregion River and Stream Investigations
Job No.: 6(SAL)-c[1]

Period Covered: July 1, 1985 - June 30, 1986

ABSTRACT

Juvenile Salmonid Densities:
Middle Fork Salmon River
Main Salmon River Tributaries

Cutthroat trout snorkel surveys conducted in main stem Middle Fork Salmon River transects in 1984 disclosed numbers of midsize (152 to 305 mm) and large size (>305 mm) fish to be within 6% of 1978 totals. Numbers of smaller, younger age cutthroat counted (<152 mm) were up ninefold (46 vs. 5) in 1984 compared to 1978. Counts of juvenile chinook salmon were up fourfold from 311 in 1978 to 1,269 in 1984.

Density counts of Juvenile steelhead trout conducted in 1985 showed an increasing trend in number of fish/100 m^2 (.61) compared to 1981 (.27), 1982 (.25) and 1983 (.52).

What appeared to be a catastrophic decline in juvenile chinook salmon and a marked decline in cutthroat numbers in comparative transects in 1985 appears to be related to time of counting rather than loss of fish. This will be tested in 1986.

Salmon River main stem tributary and Middle Fork tributary steelhead densities were similar or slightly higher in 1985 compared to 1982 and 1983 counts. Densities ranged from 4.6 to 10.3 fish/100 m^2 in Middle Fork tributaries and from 6.2-20.6 fish/100 m^2 in main stem tributaries below the Middle Fork.

A survey of float boaters in 1985 disclosed that 33.3% were anglers and 13% of these anglers fished tributary streams of the Middle Fork. An estimated range of from 28,000 to 71,000 angler-hours were expended by fishermen on the Middle Fork in the summer of 1985.

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INTRODUCTION

The Middle Fork Salmon River (MFSR), part of the Wild and Scenic Rivers System, flows through a remote area in central Idaho. Most of its length is contained within the Frank Church River-of-No-Return Wilderness Area. The headwaters of the Middle Fork, which begin at the confluence of Bear Valley and Marsh creeks, originate in the Sawtooth Range of the Salmon River Mountains. The river flows 171 km to the confluence with the main Salmon River 92 km below Salmon, Idaho (Fig. 1).

Road access exists to Dagger Falls and at the confluence with the Salmon River. A few of the tributaries, headwaters are accessible via primitive roads; the lower 156 km of the Middle Fork is accessible only by air, float craft or trail.

The MFSR is a major recreational stream, offering a wide variety of outdoor and backcountry opportunities. The number of people floating the river has increased 179% since 1973.

In 1971, a study was initiated to monitor the cutthroat trout (Salmo clarki) population in the Middle Fork Salmon River. The following year (1972), a catch-and-release regulation was established in the Middle Fork. Similar regulations were enacted on major tributary streams in the early and mid-1980's.

Snorkel transects were established and surveyed annually (Corley 1972; Jeppson and Ball 1977, 1979) to monitor the cutthroat trout population. In 1981 a wild steelhead trout (Salmo gairdneri) project was initiated on the Middle Fork (Thurow 1982, 1983, 1985). Beginning in 1985, another study was initiated to determine Juvenile steelhead and chinook salmon (O. tshawytscha) densities in the Middle Fork and its tributaries.

This report discusses data collected during 1984 that pertains to cutthroat population. The report also includes data collected in 1985 pertaining to the densities of cutthroat, Juvenile steelhead and chinook salmon in the main stem and four tributaries of the Middle Fork and in four tributaries of the Salmon River below the Middle Fork.

OBJECTIVES

1. To monitor juvenile steelhead trout and chinook salmon densities within the Middle Fork, its tributaries and tributaries of the Salmon River.
2. To monitor cutthroat trout population trends.
3. To monitor the effects of the catch-and-release regulations on cutthroat, rainbow and bull trout (Salvelinus confluentus) populations.

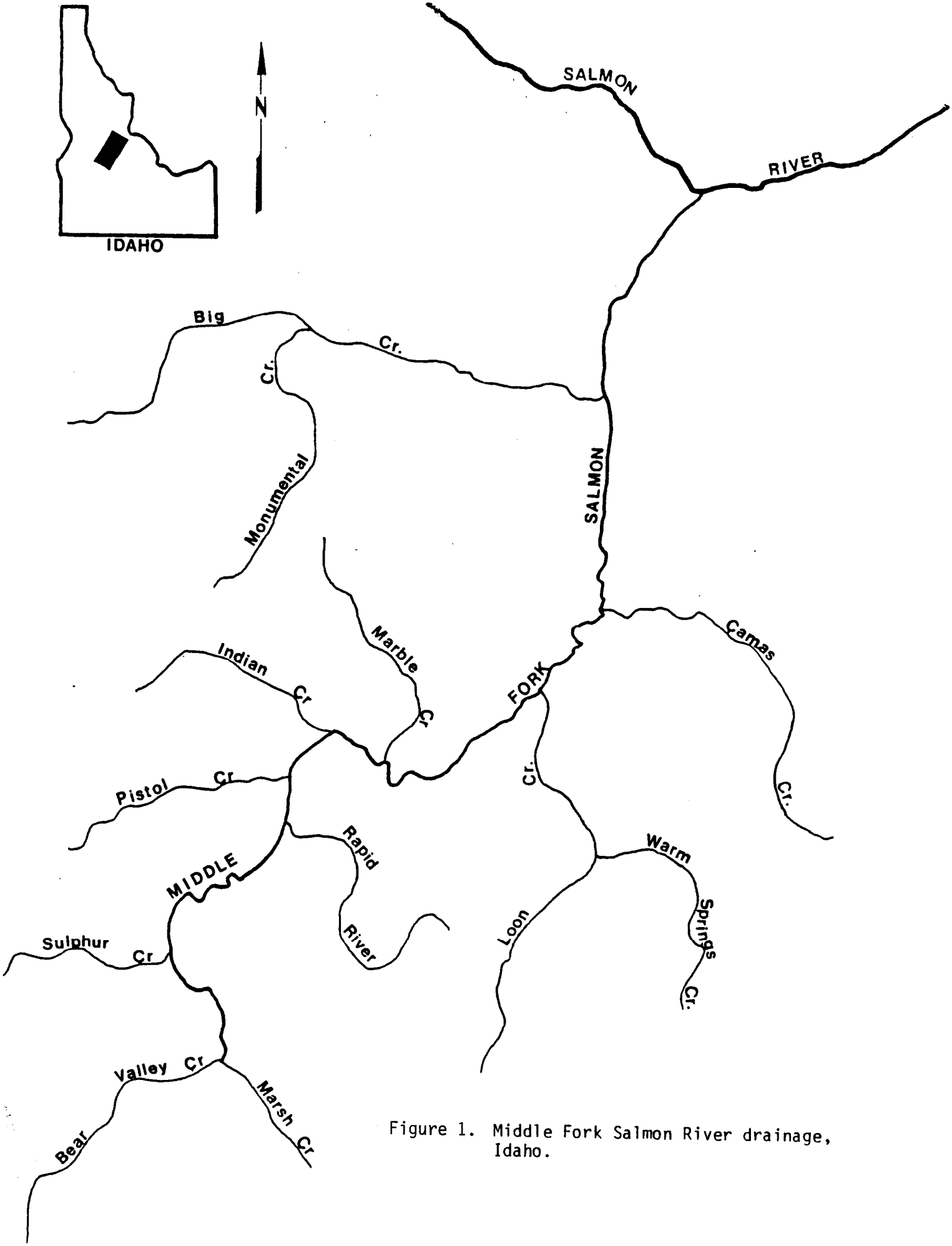

Figure 1. Middle Fork Salmon River drainage, Idaho.

1. Continue to monitor densities of juvenile steelhead, cutthroat trout and chinook salmon in the MFSR via snorkeling.

2. Determine if cutthroat trout and chinook salmon densities differ significantly between counts made in mid-July and mid-August.

3. Maintain catch-and-release regulations for cutthroat, rainbow and bull trout in the MFSR and its tributaries.

4. Maintain catch-and-release regulations for adult wild steelhead in the Salmon River and closure of the Middle Fork to steelhead fishing.

METHODS

In 1985, a total of 29 snorkel transects were selected on the MFSR (Table 1), 6 transects on 4 tributaries of the Middle Fork (Table 2) and 7 transects on 4 tributaries of the Salmon River (Table 3). Transects on the Middle Fork were selected specifically for individual species (e.g., cutthroat-trout-chinook salmon transects included pools; steelhead trout transects included runs and pocket waters). Transects were selected from those established in either 1971 or 1981 where ever possible (Table 1). The transects located on the tributaries of the Middle Fork and Salmon rivers contained a representative sample of the habitats in the streams.

In 1981, the steelhead transects were established at a river gauge reading of 2.85 on the Middle Fork Lodge measuring device. It was felt that to retain consistency of habitat, subsequent snorkel surveys should be conducted at this same flow. However, to ensure that data collected would be comparable to similar collected information basinwide in the Columbia River system, a "biological window" of July 15 to August 30 was established. It was agreed that this time period should encompass stable summer-rearing densities for steelhead and chinook salmon. In most years, the 2.85 river level and the July 15 to August 30 period coincide. However, in some low water years, the river level of 2.85 occurs prior to July 15; 1985 was such a year (July 12). Under those situations, it was determined that the time period would take precedence over river level.

The area snorkeled in all tributary transects was determined by measuring the length of the transect surveyed and calculating the mean width, based on stream widths measured each 10 m within the surveyed transect. The Middle Fork snorkel transect areas were determined by measuring the visible corridor. Underwater visibility was determined in each transect by submerging a gray metal steelhead parr silhouette, 200 mm in length, to measure the maximum distance at which it could be seen when stationary. This distance was then doubled, because the diver counted fish on both sides to calculate the width of the corridor. This method was similar to the one described by Johnson (1985).

Table 1. Middle Fork snorkel transects, 1985.

Type	Transect Name	SH #1/	CT #2/
SH	Boundary	1	
Ct/Ck	Gardell's Hole		A 3/
Ct/Ck	Velvet		B3/
SH	Elkhorn	3	
SH	Sheepeater	4	
Ct/Ck	Greyhound		C3/
SH	Rapid River	5	
SH	Indian	6	
Ct/Ck	Pungo		1
Ct/Ck	Marble Pool		3
SH	Ski-Jump	7	
Ct/Ck	Lower Jackass		5
SH	Cougar	9	
Ct/Ck	Whitey Cox		7
SH	Rock Island	10	
Ct/Ck	Hospital Pool		9
SH	Hospital Run	11	
Ct/Ck	Tappan Pool		10
SH	Lower Tappan Run	12	
Ct/Ck	Flying B		11
SH	Airstrip	14	
SH	Survey	16	
Ct/Ck	Big Creek Bridge		15
SH	Love Bar	17	
Ct/Ck	Ship Island		17
SH	Little Ouzel	19	
Ct/Ck	Otter Bar		19
Ct/Ck	Goat Creek Pool		21
SH	Goat Creek Run	20	

1/ Numbers correspond to 1982 transects.

2/ Numbers correspond to 1971 transects.

3/ Established 1985.

Table 2. Middle Fork tributary transects, 1985.

Transect Name	Description
Pistol Creek #1	At mile marker 16
Pistol Creek #2	Above mile marker 16
Marble Creek mouth	Above pack bridge
Loon Creek Bridge	Below pack bridge
Loon Creek Run	400 yards above pack bridge
Camas Creek mouth	Establish 1986
Big Creek mouth	400 yards above mouth

Table 3. Main stem Salmon River tributary transects, 1985.

Transect Name	Description
Horse Creek Bridge	50 yards above bridge
Horse Creek #2	Establish 1986
Chamberlain Creek mouth	400 yards above mouth
Chamberlain Creek run	500 yards above mouth
Bargamin Creek #1	1/4 mile above mouth
Bargamin Creek #2	At trail flat above #1
Sheep Creek #1	Establish 1986
Sheep Creek #2	Establish 1986
Pahsimeroi River Dowton Lane	Run above + pool below Dowton BridgE
Pahsimeroi River Lower	100 yards below Dowton Lane Bridge

In the tributary transects, one or two divers would make one pass upstream, counting all fish observed. In the Middle Fork transects, one or two divers would float downstream and count all fish observed. The observed fish would be separated into species and length groups (<75 mm, 76 to 150 mm, 151 to 225 mm and 226 to 300 mm). Densities were calculated for fish/100 m and fish/100 m^2.

RESULTS AND DISCUSSION

Middle Fork Salmon River Transects

In 1984, all 21 original Middle Fork cutthroat trout transects, established in 1971 (Corley 1972) were surveyed from August 22 to August 28, 1984. A total of 567 cutthroat were counted (Table 4), which was similar to that reported by Jeppson and Ball (1978) (Table 5). The percentages of total fish for various length groups (<152 mm, 152 to 305 mm and >305 mm) were 8%, 64% and 28%, respectively (Table 6), which were similar to 1978 percentages (Jeppson and Bail 1978) (Table 6).

In 1985, the number of cutthroat transects was reduced from 21 to 14 to include 11 of the original transects and 3 new ones (Table 1). Of the 14 transects scheduled in 1985, 12 were surveyed. Turbidity prevented Marble Pool and Big Creek Bridge transects from being counted.

The survey was conducted July 14 to July 21, 1985 (river gauge 2.74). This departure date was selected to correspond as close as possible to water flows of 2.85 established in 1981 (Thurow 1982) and still remain within the July 15 to August 30 survey period.

A total of 120 cutthroat were counted in 1985, a decline of 78% and 79% from 1978 and 1984 totals, respectively (Tables 5 and 7). Although the total number of cutthroat counted declined in 1985, the percentages for length groups (<152 mm, 152 to 305 mm and >305 mm) were 7%, 59% and 34%, respectively, similar to the 1978 and 1984 percentages (Table 6). The cutthroat transects established in 1971 were surveyed after mid-August that year and in all subsequent years except for 1985. The 1985 counts were conducted July 14 to July 21 and the 1984 counts during August 22 to August 28. Similar age composition of the cutthroat population counted in both years, however, indicated that the population structure had not changed. We believe the earlier counting time produced the lower counts.

Similarly, chinook salmon juvenile counts showed a catastrophic decline in 1985 over 1984 in comparative transects (595 vs. 1) Table 7). However, chinook salmon spawning ground redd counts in 1983 and 1984 for the Marsh Creek, Bear Valley Creek and Sulphur Creek drainages at the headwaters of the Middle Fork were nearly the same (135 vs. 142). As with the cutthroat, we are inclined to contribute the lack of chinook salmon in the count areas to timing (July 14 to July 21 in 1985 versus August 22 to August 28 in 1984) rather than loss in the 1984 year class.

Table 4. Numbers of fish observed in Middle Fork Salmon River cutthroat snorkel transects surveyedin 1984.

Location	Cutthroat <152	Cutthroat 152-305	Cutthroat >305	Snorkel transects surveyed in Rb	Bt	Ck	Su	Sq	Rs	Wf
Pungo	2	11	6	0	0	100±	0	1	0	20
Teapot	3	8	9	7	0	50	0	0	0	24
Marble Creek	28	46	40	1	0	150	2	3	0	25
Little Creek	5	25	14	1	1	50	25	0	0	35
Lower Jackass	0	17	9	2	0	150	0	1	0	6
Mahoney	0	18	10	6	0	200	0	0	0	2
Whitey Cox	0	21	5	1	0	200	7	8	0	3
White Creek	6	33	3	4	0	200	0	2	0	18
Hospital Bar	2	15	8	3	0	125	0	0	0	3
Tappan Pool	0	13	4	4	0	10	21	18	0	18
Flying B	0	3	4	0	0	0	2	5	0	6
Bernard G. S.	0	28	5	8	0	5	28	15	0	55
Wilson Creek	0	8	0	2	0	15	10	2	0	2
Rattlesnake Cave	0	10	6	2	0	0	3	4	0	7
Big Creek	0	10	2	7	0	0	7	31	0	16
Ship Island	0	5	0	2	0	0	25	0	0	8
Parrot	0	21	1	4	0	1	7	0	0	17
Cliffside	0	11	4	3	0	1	0	1	0	11
Otter Bar	0	26	9	4	0	10	23	10	82	27
Hancock Rapids	0	20	9	4	0	2	17	10	35	62
Goat Creek	0	13	11	2	0	0	11	2	50	28
Total	46	362	159	67	1	1,269	188	113	167	393

Rb = rainbow-steelhead trout
Bt = bull trout
Ck = chinook salmon
Su = suckers
Sq = squawfish
Rs = redside shiners
Wf = whitefish

Table 5. Cutthroat trout observed in the Middle Fork Salmon River transects Separated into length groups (mm), 1971, 1978 and 1984.

	1971			1978			1984		
Location	<152	152-305	>305	<152	152-305	>305	<152	152-305	>305
Pungo	0	4	0	3	10	17	2	11	6
Teapot	0	4	0	0	10	15	3	8	9
Marble Creek	0	3	0	0	51	10	28	46	40
Little Creek	0	5	2	0	25	0	5	25	14
Lower Jackass	0	12	2	0	21	7	0	17	9
Mahoney	0	13	4	0	31	7	0	18	10
Whitey Cox	0	5	0	0	27	9	0	21	5
White Creek	0	17	4	0	11	14	6	33	3
Hospital Bar	0	5	11	0	12	6	2	15	8
Tappan Pool	0	7	4	0	19	5	0	13	4
Flying B	0	2	0	0	5	3	0	3	4
Bernard Cr. G.S.	0	5	0	0	11	5	0	28	5
Wilson Creek	0	8	0	0	7	2	0	8	0
Rattlesnake Cave	0	2	0	0	19	6	0	10	6
Big Creek	0	4	0	2	9	1	0	10	2
Ship Island	0	3	0	0	22	13	0	21	1
Parrot	0	15	0	0	22	13	0	21	1
Cliffside	0	5	0	0	20	6	0	11	4
Otter Bar	0	14	0	0	18	14	0	26	9
Hancock Rapids	0	33	0	0	17	15	0	20	9
Goat Creek	0	17	0	0	25	10	0	13	11
Total		183	27	5	392	178	46	378	160
Combined Total		210			575			584	

Table 6. Numbers and percentages of length groups of cutthroat trout observed in Middle Fork Salmon River cutthroat snorkel transects, 1971, 1978, 1984 and 1985.

Year	Length Groups (mm)					
	<152		152-305		>305	
			#	%	if	
1971	0	0	183	87	27	13
1978	5	1	392	68	178	31
1984	46	8	378	65	160	27
1985	8	7	71	59	41	34

Table 7. Comparative counts of chinook salmon and cutthroat trout made in the same transects in 1984 and 1985.

Transect[a]	Cutthroat		Chinook	
	1984	1985	1984	1985
Pungo	19	2	100+	0
Lower Jackass	26	3	150	0
Whitey Cox	26	4	200	0
Hospital Pool	23	12	125	0
Tappan Pool	17	3	10	1
Flying B	7	6	0	0
Ship Island	5	6	0	0
Otter Bar	35	17	10	0
Goat Cr. Pool	24	8	0	0
	182	61	595	1

[a]1984 counts conducted August 22-28.
1985 counts conducted July 14-21.

We feel that comparative counts in July and August should be made to determine if the timing factor is as critical as it appears. Downstream distribution and size of young-of-the-year chinook could be a significant factor in summer density counts between mid-July and late August. Cutthroat trout could still be in upper spawning areas in mid-July versus late August.

Fifteen juvenile steelhead trout snorkel transects were selected from 20 original transects established by Reingold (1981) to be surveyed on a yearly basis (Table 1). In 1985, 13 transects were surveyed from July 14 to July 21; two transects were eliminated by turbidity. A total of 56 juvenile steelhead were counted in the steelhead transects (Table 8). This was a 65% reduction from the 1983 total of 161 juvenile steelhead counted in the same transects. This reduction exactly correlates to a 65% reduction in area snorkeled. In 1985, 11,187 m^2 were surveyed compared to 32,298 m^2 surveyed in 1983 (Table 9). The reason for the reduction in the snorkeled area was twofold. First, some transects were surveyed with one pass instead of two; second, turbidity was higher, reducing the visible corridor. Age classes I, II and Ill comprised 25%, 66% and 9%, respectively, of the total number of juvenile steelhead observed. These percentages were similar to those reported in 1983 by Thurow (1985) (Table 10). Density is the measurement that we deem most significant in evaluating juvenile steelhead population trends. Juvenile steelhead densities (fish/100 m^2) have increased from 0.27 fish/100 m^2 in 1981 to 0.61 fish/100 m^2 in 1985 (Table 11).

In the upper Salmon River system, much work has been done through the years that shows most steelhead fry emergence occurs after the first part of July. These young-of-the-year fish occupy rearing areas that are not readily observed by snorkel divers while making counts in typical pocket-run habitat. Their minute size, plus their shoreline, bottom dwelling and shelter-seeking behavior normally exclude them from snorkel counts, particularly in main stem river observations.

Age-I, II and Ill steelhead normally observed by snorkelers have entered these rearing areas at least one year before. Because they are not leaving these areas to spawn and return as do cutthroat trout (and because they are not moving into the system from upstream emergence areas to the extent that chinook salmon juveniles do), we do not expect the difference in July versus August counts to be as great for steelhead as for cutthroat and chinook.

Middle Fork Salmon River Tributaries

Six transects on four Middle Fork tributaries were surveyed in 1985. A total of 128 juvenile steelhead were observed. Juvenile steelhead densities ranged from 4.6 to 10.3 fish/100 m^2 (Table 12). These densities were slightly higher than densities reported by Thurow for Pistol Creek (2.3 fish/100 m^2), Loon Creek (3.8 fish/100 m^2) and Big Creek (6.0 fish/100 m^2) (Thurow 1982), but were lower for Marble Creek (1.7 fish/100 m^2) (Thurow 1985). Chinook salmon were observed in both Pistol Creek #2 and Loon Creek Bridge transects (Table 12). Cutthroat trout and whitefish were the only other game fish observed.

Table B. Total number and species of fish counted in Middle Fork Salmon River transacts, 1985.

Location	Type	Cutthroat 75–150	Cutthroat 150–230	Cutthroat 230–300	Cutthroat >300	Rainbow steelhead 75–150	Rainbow steelhead 150–230	Rainbow steelhead 230–300	Rainbow steelhead >300	Chinook salmon Age 0	Chinook salmon Age I	Bull trout	White fish	Redside shiners
Boundary	SH			7	3	6	9	1	-	-	-	-	14	-
Gardell's Hole	Ct/Ck	5	2	-	-	-	1	2					8	
Velvet	Ct/Ck			-	2	11	4				1		2	1
Elkhorn	SH			1	5	2	9	2					7	
Sheepeater	SH			-	-	3	8	1					6	
Greyhound	Ct/Ck			-	6	-	2						4	
Rapid River	SH	Not Surveyed		-	2	-	2							
Indian	SH													
Pungo	Ct/Ck		2	-	-	-	-	3	-	-	-	-	-	-
Marble Pool	Ct/Ck	Not Surveyed		2	2	-	-	-	-	-	-	-	4	-
Ski-jump	SH													
Lower Jackass	Ct/Ck		2	1	-	1	-	-	-	-	-	-	-	-
Cougar	SH			2	2	-	2	1	-	-	-	-	4	-
Whitey Cox	Ct/Ck			3	1	-	-	-	-	-	-	-	1	-
Rock Island	SH	Not Surveyed		8	1	1	1	-	-	-	-	-	2	-
Hospital Pool	Ct/Ck	–	3											
Hospital Run	SH	–	2	4		1	1	-	-	-	-	-	1	-
Tappan Pool	Ct/Ck			3	-	-	-	-	-	-	-	-	-	-
L. Tappan Run	SH	1		-	-	-	-	-	-	2	-	-	2	-
Flying B	Ct/Ck			6	-	-	-	-	-	-	-	-	6	-
Al rstri p	SH			2	2	-	2	-	-	-	-	-	1	-
Survey	SH			6	1	-	1	-	-	-	-	-	2	-
Big Creek Bridge	Ct/Ck	Not Surveyed		-	-	1	1	-	-	-	-	-	2	-
Love Bar	SH	–	1											
Ship Island	Ct/Ck				6	3	-	1	-	-	-	-	-	-
Little Ouzel	SH			1	-	-	-	-	-	-	-	-	5	-
Otter Bar	Ct/Ck	2	7	3		5	3	1					26	23
Goat Cr. Pool	Ct/Ck			-	8	2	-	-	-	-	-	-	37	40
Goat Cr. Run	SH			3	-	1	2	-	-	-	-	-	16	-
Total	8		19	52	41	37	48	12	0	2	1	0	150	63

Table 9. Area snorkeled in Middle Fork Salmon River transects, 1985.

Location	Length(m)	Visibility(m)	Visible corridor	Area m^2
Boundary	47.5	4.3	8.6	409
Gardell's Hole	69.5	4.3	17.2 (2 passes)	1,195
Velvet	37.0	4.3	8.2	318
Elkhorn	114.0	4.6	9.2	1,049
Sheepeater	95.0	4.6	18.4 (2 passes)	1,748
Greyhound	58.0	4.6	18.4 (2 passes)	1,067
Rapid River		Not Surveyed		
Indian	160.0	2.4	4.8	768
Pungo	70.0	2.7	10.8 (2 passes)	756
Marble Pool		Not Surveyed		
Ski-jump	88.0	3.0	12.0 (2 passes)	1,056
Lower Jackass	252.0	3.0	12.0 (2 passes)	3,024
Cougar	114.0	2.4	9.6 (2 passes)	1,094
Whitey Cox	101.0	3.0	12.0 (2 passes)	1,212
Rock Island		Not Surveyed		
Hospital Pool	71.0	3.0	12.0 (2 passes)	852
Hospital Run	161.0	3.0	6.0	966
Tappan Pool	110.0	3.0	12.0 (2 passes)	1,320
L. Tappan Run	77.0	3.0	6.0	462
Flying B	82.0	3.7	14.8	1,214
Airstrip	114.0	3.7	7.4	844
Survey	155.0	3.7	7.4	1,147
Big Cr. Bridge		Not Surveyed		
Love Bar	91.0	3.4	6.8	619
Ship Island	128.0	3.4	13.6 (2 passes)	1,741
Little Ouzel	96.0	3.4	6.8	653
Otter Bar	206.0	3.4	13.6 (2 passes)	2,801
Goat Cr. Pool	366.0	3.0	12.0 (2 passes)	4,392
Goat Cr. Run	62.0	3.0	6.0	372
			Total Area	31,079
			SH Area	11,187
			Ct/Ck Area	19,892

Table 10. Age frequency of steelhead parr for Middle Fork Salmon River steethead transacts, 1980-1985.

	1980				1981				1982				1983				1985			
	I	II	III	T	I	II	III	T	I	II	III	T	I	II	III	T	I	II	III	T
Boundary	3	5	0	8	6	8	2	16	–	2	–	2	4	3	1	8	6	9	1	16
Elkhorn	3	2	0	5	2	2	–	4	2	1	4	7	3	7	2	12	2	9	2	13
Sheepeater	–	–	–	–	1	1	–	2	3	1	–	4	1	0	1	2	3	8	1	12
Rapid River	1	4	0	5	10	7	2	19	13	10	2	25	9	13	4	26	Not Surveyed			
Indian	1	1	1	3	–	1	–	1	2	3	–	5	3	8	1	12	0	2	0	2
Ski-jump	0	0	0	0	6	2	–	8	1	5	1	7	3	5	3	11	0	0	0	0
Cougar	0	0	0	0	3	3	3	9	4	5	2	11	5	11	3	19	0	2	1	3
Rock Island	1	2	0	3	2	9	1	12	5	7	1	13	2	5	0	7	Not Surveyed			
Hospital Run	0	6	0	6	4	4	3	11	11	3	2	16	4	11	2	17	1	1	0	2
L. Tappan Run	3	1	1	5	2	5	1	8	10	9	2	21	2	3	0	5	0	0	0	0
Airstrip	5	2	1	8	6	3	1	10	5	8	2	15	1	10	3	14	0	2	0	2
Survey	1	3	1	5	3	3	1	7	4	7		11	1	3	1	5	0	1	0	1
Love Bar	1	3	1	5	5	4	2	11	3	3	1	7	1	6	3	10	1	1	0	2
Little Ouzel	10	1	0	11	3	4	2	9	4	1	–	5	3	5	4	12	0	0	0	0
Goat Cr. Run	0	0	0	0	8	4	–	12	4	5	1	10	–	2	2	4-	1	2	0	3
Total	29	30	5	64	61	60	18	139	71	70	18	159	42	92	30	164	14	37	5	56
Percentage	45	47	8		43	44	13		45	44	11		26	56	18		25	66	9	

Table 11. Juvenile steelhead densities, Middle Fork Salmon River steelhead transects, 1980-1983 and 1985.

	1980		1981		1982		1983		1985	
Location	SH/100m	SH/100m^2	SH/100m	SW100m^2	SH/100m	SH/100m^2	SW100m	Sii/100m^2	SFI/100	SH/l00m^2
Boundary	4.2	-	8.5	0.57	3.0	0.08	6.2	0.49	33.0	3.9
Elkhorn	2.3	-	1.9	0.14	6.9	0.20	6.2	0.47	11.0	1.2
Sheepeater	0	-	1.5	0.11	3.5	0.20	2.2	0.16	12.6	0.70
Rapid Run	1.6	-	5.8	0.44	17.0	0.48	10.5	0.75		Not Surveyed
Indian	0.8	-	0.3	0.02	3.3	0.11	5.2	0.66	1.2	0.30
Ski-Jump	0	-	3.1	0.22	3.4	0.11	3.0	0.39	0	0
Cougar	0	-	2.1	0.15	6.0	0.16	7.0	0.86	2.6	0.30
Rock Island	1.1	-	4.4	0.31	9.6	0.26	6.7	1.19		Not Surveyed
Hospital Run	1.2	-	2.4	0.19	6.8	0.22	5.3	0.80	1.2	0.20
Lower Tappan Run .	2.3	-	3.7	0.29	15.0	0.48	2.0	0.31	0	0
Airstrip	2.3	-	2.8	0.26	10.6	0.33	6.1	0.66	1.8	0.2
Survey	3.0	-	4.1	0.38	7.8	0.49	2.2	0.24	0.6	0.1
Love Bar	2.6	-	5.6	0.47	6.5	0.21	1.8	0.22	2.2	0.3
Little Ouzel	0.2	-	2.8	0.24	3.0	0.10	3.7	0.38	0	0
Goat Cr. Run	0	-	2.8	0.24	10.9	0.35	2.4	0.25	4.B	0.8
Average	1 d	-	3.5	0.27	7.6	0.25	4.7	0.52	5.5	0.61

Table 12. Middle Fork tributary transects, species counts and densities, 1985.

		Rainbow Steelhead					Cutthroat					Chinook					
												Age					
Location	Lengths mm	<75	75-150	150-230	230-300	Rb/100m^2	<75	75-150	150-230	230-300	>300	0	I	Ck/100m^2	Bk	Wf	Bt
Pistol Cr. 1		6	1	6	2	10.3	-	-	1	-	1	-	-	-	-	2	-
Pistol Cr. #2		4	3	4	3	4.6	1	5	7	11	2	4	-	1.3	-	12	-
Marble Creek		-	2	3	-	0.8	-	-	1	-	-	-	-	-	-	1	-
Loon Cr. Bridge		-	13	3	1	9.3	3	3		4	-	15	1	8.8	-	5	-
Loon Creek Run		6	12	6	-	5.3	-	-	-	-	-	-	-	-	-	3	-
Big Creek		9	32	12	-	8.2	-	-	-	-	-	-	-	-	-	8	-
Camas Cr.			Not Surveyed														

Salmon River Tributaries

Seven transects on four Salmon River tributaries were surveyed in 1985. The number of juvenile steelhead trout counted was 403 (Table 13). The highest densities of young steelhead occurred in the Pahsimeroi River (40.6 and 74.4 fish/100 m^2) (Table 13). These high densities probably result from a combination of residuals from smolt releases made in the spring of 1985, adult steelhead spawning upstream and resident rainbow trout. The densities in the other tributaries ranged from 6.2 to 20.6 fish/100 m^2 (Table 13). These densities were similar to densities reported by Reingold (1982) in Horse Creek, Chamberlain Creek and Bargamin Creek, which were 12.5, 9.5 and 9.8 fish/100 m^2, respectively. Chinook salmon were observed in one transect on the Pahsimeroi River (Table 13). The two age-I fish could have resulted from 1985 chinook smolt releases.

Length-Frequencies of Fish Caught in the Middle Fork, 1984-1985

Length-frequencies of cutthroat and juvenile steelhead trout collected by hook and line were recorded for 1984 and 1985 to compare changes, if any, in the population structures of either species. Examination of cutthroat trout length-frequencies indicated that no significant changes have occurred since 1978 (Fig. 2). Mean lengths of cutthroat trout caught in 1978, 1984 and 1985 were 286 mm, 271 mm, and 287 mm, respectively.

It appears that no significant changes in juvenile steelhead length-frequencies occurred between 1981 to 1983 and 1985 (Fig. 3). The majority of the fish occurred between lengths of 150 to 210 mm during 1981 to 1983 (Thurow 1985); in 1985, the majority of fish caught were between 170 to 210 mm. The variation in sample size in both cutthroat and juvenile steelhead trout was directly related to fishing effort.

Middle Fork Salmon River Float Boaters Survey, 1985

Between July 30 to August 13, 1985, a survey of MFSR float boaters was conducted to determine the percentage of boaters that were anglers and what percentages of anglers utilized the Middle Fork tributaries. There was a total of 426 floaters surveyed: 87% floated with commercial outfitters and 13% floated privately. Anglers comprised 33.3% (142) of the floaters and 13% of the anglers fished in the Middle Fork tributaries.

The Challis National Forest U.S. Forest Service estimated that 7,723 people floated the MFSR during May 1 to September 10, 1985. Applying the above-percentage to this figure, a total of 2,572 people fished the Middle Fork, with 334 people utilizing the tributaries. The average number of days spent floating the river was 5.5/person. This expands to 14,146 angler days. Assuming that anglers fished 2 to 5 hr/day, then total fishing effort ranged from 28,292 to 70,730 hr during the summer of 1985.

Table 13. Salmon River tributary transacts, species counts and densities, 1985.

	Rainbow Steelhead						Cutthroat					Chinook							
												Aga							
Location	<75	75-150	150-230	230-300	>300	Rb/100m²	<75	75-150	150-230	230-300	>300	0	I	Ck/100m²	Bt	Bk	Wf	Rb/100m²	1981
Horse Cr. Bridge	21	22	38	8	–	20.6	–	–	–	–	–	–	–	–	–	–	17	12.5	
Horse Cr. #2		Establish 1986																	
Chamberlain Cr. mouth	4	3	8	–	–	10.6	–	–	–	–	–	–	–	–	–	–	12	9.5	
Chamberlain Run	3	3	7	3	–	9.8	–	–	–	–	2	–	–	–	–	–	27	–	
Bargamin Cr. #1	4	6	13	1	2	9.7	–	–	–	–	1	–	–	–	–	–	3	9.8	
Bargamin Cr. #2	6	4	13	2	–	6.2	–	–	1	–	–	–	–	–		–	3	–	
Sheep Cr. #1		Establish 1986																	
Sheep Cr. #2		Establish 1986																	
Pahsimeroi River Dowton Lane	–	–	60	50	31	40.6					–	–	–	–	–	1	26	–	
Pahsimeroi River Lower	–	–	77	14	2	74.4	–	–	–	–	–	2	2	3.2	–	6	19	–	

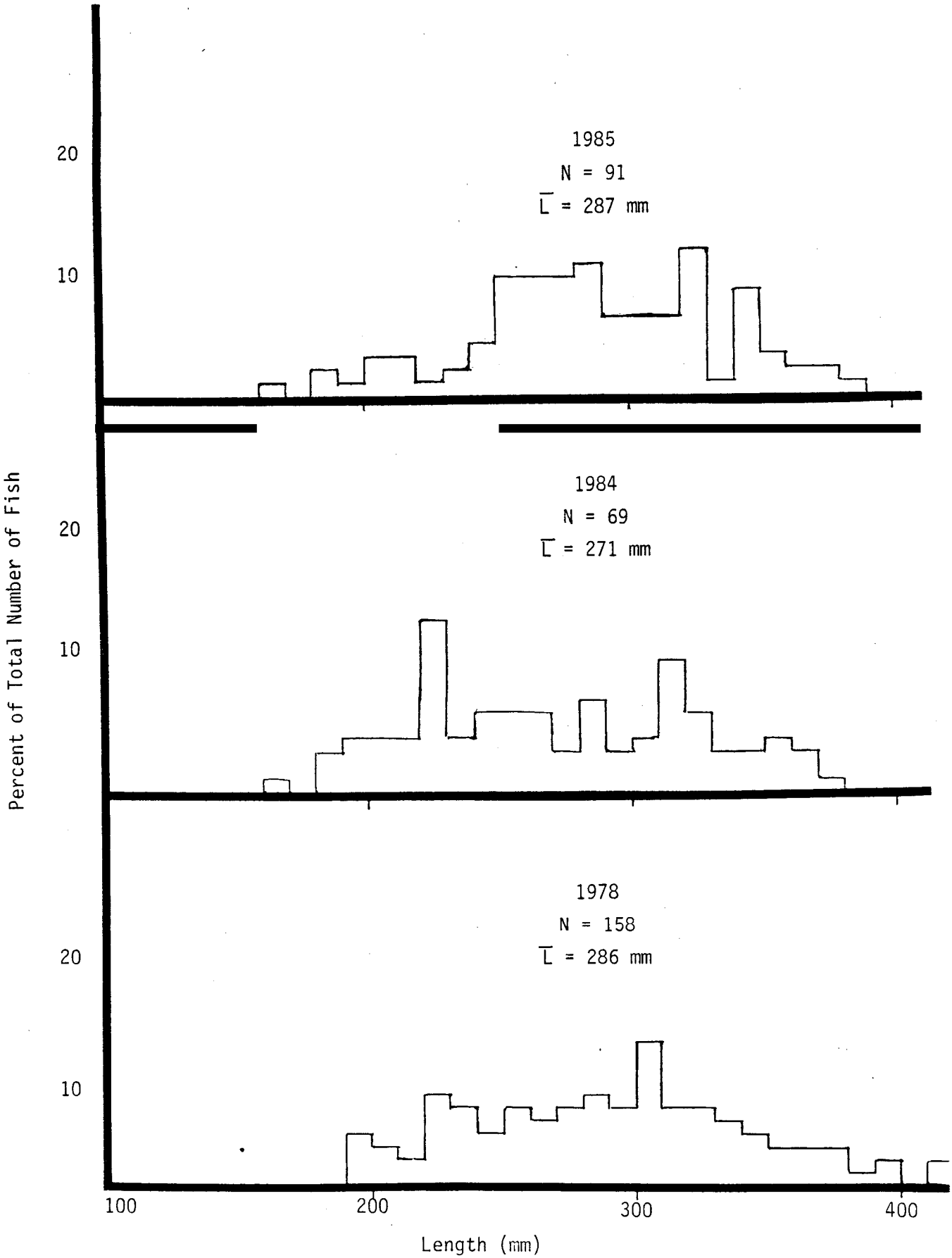

Figure 2. Length-frequencies of cutthroat trout collected via hook and line from Middle Fork Salmon River, 1978, 1984 and 1985.

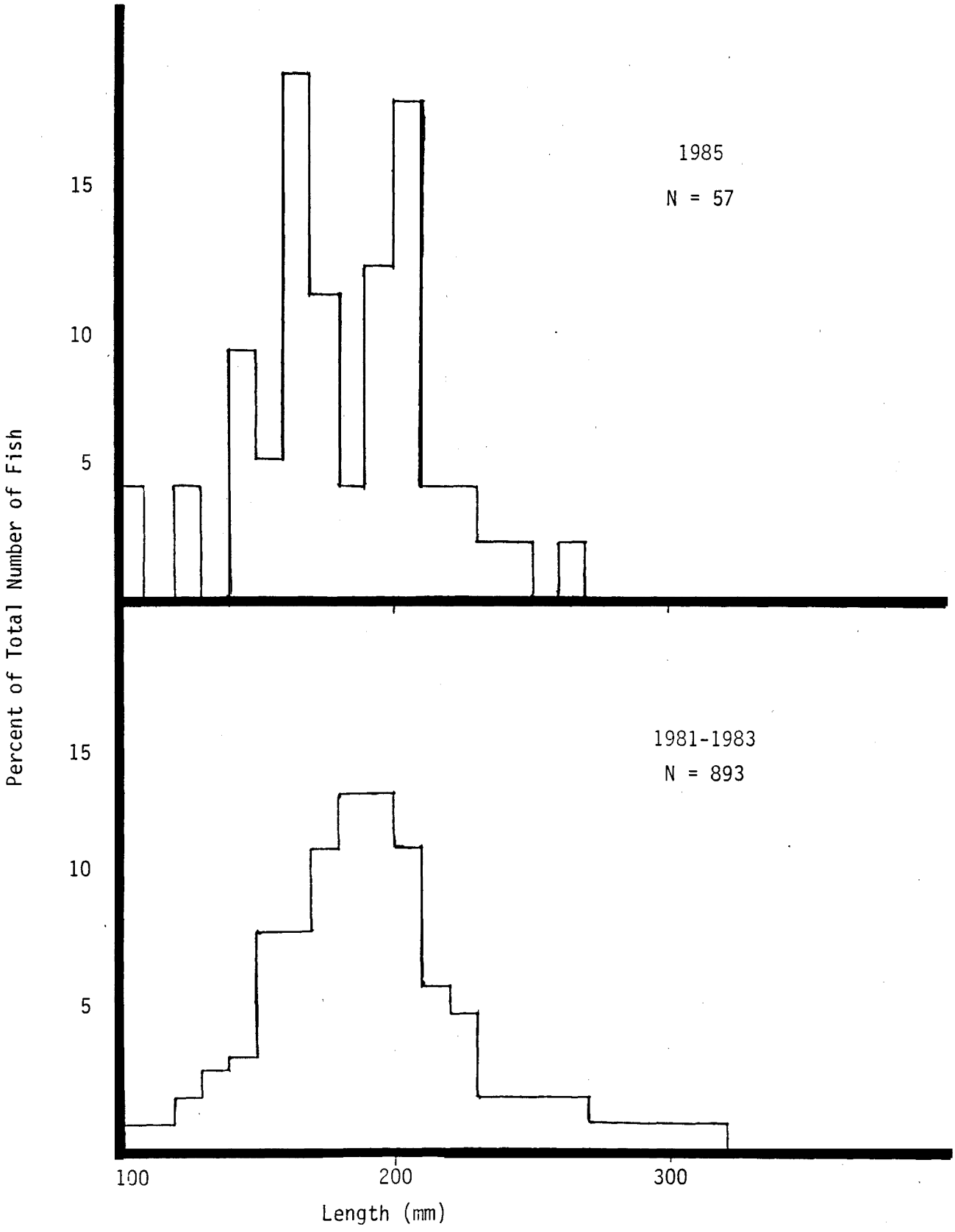

Figure 3. Length-frequencies of juvenile steelhead trout collected by hook and line from Middle Fork Salmon River, 1981-1983 and 1985.

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APPENDICES

APPENDIX A

Middle Fork Salmon River tributary transects' description and area surveyed, 1985.

Location	Description	Length (m)	Width (m)	Area (m^2)
Pistol Cr. #I	at mile marker 16	15	9.7	146
Pistol Cr. #2	above mile marker 16	30	10.2	306
Marble Cr. mouth	above Pack Bridge	75	7.9	593
Loon Cr. Bridge	below Pack Bridge	17	10.7	182
Loon Cr. Run	400 yd. above Pack Bridge	30	15.0	450
Camas Cr.	Establish 1986	-	-	-
Big Creek mouth	400 yd. above mouth	72	9.0	648

APPENDIX B

Salmon River tributary transects' description and area surveyed, 1985.

Location	Description	Length (m)	Width (m)	Area (m^2)
Horse Creek Bridge	50 yds. above bridge	48	8.8	422
Horse Creek #2	establish 1986	-	-	-
Chamberlain Cr. #1	400 yds. above mouth	24	5.9	142
Chamberlain Cr. #2	500 yds. above mouth	23	8.0	184
Bargamin Cr. #1	1/4 mile above mouth	25	9.9	248
Bargamin Cr. #2	at Trail Flat above #1	37	10.9	403
Sheep Cr. #1	establish 1986	-	-	-
Sheep Cr. #2	establish 1986	-	-	-
Pahsimeroi R. Dowton Lane	run above, plus pool below Dowton Bridge	30	11.6	347
Pahsimeroi R. Lower	200 yd. below Dowton Bridge	19	6.6	125

APPENDIX C

Comparative numbers of fish counted in cutthroat trout snorkel transects on the Middle Fork Salmon River, 1971, 1978 and 1984.

CUTTHROAT TROUT

Less than 152 mm (6 in.)			152-305 mm (6–12 in.)			Greater than 305 mm (12 in.)		
1971	1978	1984	1971	1978	1984	1971	1978	1984
0	5	46	183	376	362	27	169	159

Total cutthroat			Rainbow trout			Bull trout			Whitefish		
1971	1978	1984	1971	1978	1984	1971	1978	1984	1971	1978	1984
210	550	567	37	77	67	14	1	1	489	471	393

Chinook (juv.)			Squawfish			Sucker			Redside shiner		
1971	1978	1984	1971	1978	1984	1971	1978	1984	1971	1978	1984
700	311	1,269	179	28	113	158	113	189	50	-	167

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APPENDIX D.

Middle Fork Salmon River cutthroat trout transects, individual counts, 1971, 1976, 1978, 1984 and 1985.

Location	1971	1976	1978	1984	1985
Gardell's Hole[a]					7
Velvet[a]					2
Greyhound[a]					6
Pungo	4	NS	30	19	3
Teapot	4	NS	25	20	D
Marble Creek	3	NS	61	114	NS
Little Cr. G.S.	7	NS	25	44	D
Lower Jackass	14	14	28	26	3
Mahoney	17	5	38	28	D
Whitey Cox	5	2	36	26	4
White Creek	211	23	25	42	D
Hospital Run	16	10	18	25	12
Tappan Pool	11	8	24	17	3
Flying B	2	NS	8	7	6
Bernard Cr. G.S.	5	NS	16	33	D
Wilson Cr.	8	4	9	8	D
Rattlesnake Cave	2	6	25	16	D
Big Creek Bridge	4	1	12	12	NS
Ship Island	3	13	10	5	6
Parrot	15	14	35	22	D
Cliffside Pool	5	15	26	15	D
Otter Bar	14	5	32	35	12
Hancock Pool	33	13	32	29	D
Goat Creek Pool	17	11	35	24	8
Total	210	144[b]	550	567	57[c]

[a]Established 1985.
[b]Several transects not surveyed.
[c]Total does not include top 3 transects.
NS = Not surveyed.
D = Deleted.

JOB PERFORMANCE REPORT

State of: Idaho Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-10
Job No.: 6(SAL)-c2

Title: Region 6 Salmon Subregion Salmon River and Stream Investigations

Period Covered: July 1, 1985 - June 30, 1986

ABSTRACT

Fivemile Creek Isolated Rainbow Trout

A genetically unique rainbow trout population was found above impassable barriers in Fivemile Creek, a minor tributary of the Salmon River in the Frank Church River-of-No-Return Wilderness. A field survey in 1985 disclosed that the population extended approximately 6.4 km (4 mi) above the lowermost barrier in this high-gradient stream (104 m/km or 546 ft/mi).Sexually mature individuals as small as 150 mm in total length (2+ years) were found. Scale analyses disclosed four annuli present on the oldest and largest (240 mm) individuals collected.

Forty-eight fish were screened for electrophoretically detectable variation at 47 loci. Genetic variation was detected for 9 loci for the common allele in rainbow trout. Two variant alleles are unique to this population and are most likely a result of a very long period of reproductive isolation.

Four of the five bilateral meristic characteristics examined showed significant differences from other isolated rainbow stocks examined (mandibular pores, pectoral fin rays and upper and lower gill raker counts).

A high average heterozygosity (0.068) is presently unexplained. It may be related to the presence of sub-isolated groups above upper barriers. Further investigation of these fish is recommended.

Author:

Melvin Reingold
Regional Fishery Manager

INTRODUCTION

In 1982, a stream survey disclosed the presence of rainbow trout above a series of impassable barriers in Fivemile Creek, a minor tributary of the Salmon River in central Idaho. Electrophoretic analyses of these fish showed them to be genetically distinct from all other rainbow (both anadromous and nonanadromous) populations examined in the upper Columbia River drainage. This difference also exists between the rainbow population below the barriers in this same stream.

Physical examination revealed characteristics which were different from other rainbow populations, such as the numbers of pectoral fin rays, the upper and lower gill rakers and the mandibular pores.

In 1985, a field survey was conducted to determine the extent of this isolated population in Fivemile Creek, its general biological structure and the general characteristics of the stream environment. These are described in this report.

The distinctiveness of the Fivemile Creek rainbow population appears to be the result of a very long period of reproductive isolation. As such, these fish are a unique and valuable genetic resource that deserves further study.

OBJECTIVES

1. To investigate the Fivemile Creek drainage to determine the extent of the fish population above the lowermost barrier.
2. To determine if species other than rainbow trout are present and define the age structure and age at maturity of the fish population.
3. To investigate one alpine lake in the drainage to determine if past aerial plants of cutthroat trout existed in the lake and if they possibly entered Fivemile Creek.
4. To conduct electrophoretic analyses of the rainbow-steelhead juveniles below the barriers to help determine the extend of genetic differentiation of the isolated population.
5. To survey the general physical characteristics of Fivemile Creek and the possible existence of sub-isolated populations of fish behind other barriers.
6. To gain knowledge about the area and fish to help determine further study needs and to guide the planning of research and management directions.

RECOMMENDATIONS

A definitive research study of the Fivemile Creek rainbow should be initiated to provide an in-depth evaluation of the fish population. This should include, but not be limited to:

1. Intensive sampling to ensure other species are not present, including nongame species such as sculpin.

2. Population density estimates over representative stream reaches to produce an estimate of the total population size.

3. Electrophoretic analyses of upper segments of the population that appear to be above other impassable barriers.

4. Further comparison of meristic characteristics between Fivemile Creek rainbow and other anadromous and nonanadromous rainbow strains.

5. Possible geological inspection of the barrier materials to assist in estimating the length of time they have been in place.

6. Detailed mapping and photographic documentation of all barriers, slide areas and the determination of the absolute upper limit of the fish population.

7. Investigation of the potential value of these fish to researchers in allied scientific fields such as taxonomy, genetics, etc.

8. Aerial stocking of fish into Little Sheepeater Lake should be discontinued.

In addition, management possibilities could include recommendations to consider:

1. Extending the upper limits of the population by moving fish above the final barrier.

2. Establishing an additional population of Fivemile rainbow in other suitable isolated streams.

3. Evaluating the performance of Fivemile rainbow in other environments, such as an isolated alpine lake.

4. Development of a captive broodstock of Fivemile rainbow to be available for experimental outplants or other purposes.

5. Emphasizing the uniqueness of this resource to the area land management agency (USFS) to assist in formulating their land-use plans for the area, including such factors as firefighting policy.

6. Protection of the population from any increase in exploitation due to the inevitable dissemination of knowledge about its existence.

DESCRIPTION OF THE AREA

Fivemile Creek enters the Salmon River from the south, approximately 221 km (138 mi.) upstream from its mouth and approximately 6.4 km (4 mi) above the confluence of the South Fork Salmon River. Its headwaters lie on the western perimeter of Chamberlain Basin in the Frank Church River-of-No-Return Wilderness in central Idaho in T23N,R9E. An alpine lake (Little Sheepeater) heads the drainage at 2,327 m above sea level (7,636 ft). From this point, Fivemile Creek flows 15.7 km (9.8 mi) to the Salmon River at an elevation 697 km above sea level (2,286 ft) for an average gradient of 104 m/km (546 ft/mi) (Figs. 1 and 2).

Access is difficult. Trails from the Chamberlain Basin landing field lead to the headwaters 19 km (12 mi) west over passes nearly 2,438 m (8,000 ft) above sea level. There is no trail down Fivemile Creek from the headwater areas.

On the north side of the Salmon River, a low-grade road descends from the settlement of Dixie, Idaho, to the river at Mackay Bar. A primitive 4-wheel-drive road then proceeds upriver for approximately 4.8 km (3 mi) to Painter Bar. A boat can then be used to cross the Salmon River to the mouth of Fivemile Creek. At the mouth (on the east side of the creek), the historical homestead of Sylvan "Buckskin Bill" Hart is maintained by private caretakers. A trail proceeds up the east side of Fivemile Creek for approximately 1.6 km (1 mi), crosses the creek, proceeds for another .4 km (.25 mi) up the west side, then turns west and leaves the drainage. At that point, traveling directly up the stream bed is the most practical route. The first barriers lie approximately 450 m (500 yd) above this point and a short distance upstream from Grizzly Gulch.

During the survey, we traveled approximately 85 km (53 mi) down the Salmon River by whitewater jet boat from the road's end at Corn Creek to the lower end of Fivemile Creek. This mode of transport can be used to reach the stream from the end of the Salmon River road at Vinegar Creek, which is approximately 48 km (30 mi) downstream.

Fivemile Creek is one of the smaller Salmon River tributaries. I estimated the mid-summer (minimum) flow level in 1985 at 40 to 50 cfs. Travel by land is difficult: Fivemile Creek is contained in a very steep, rugged canyon, covered with thick forest and vegetation. The high gradient of 104 m/km (546 ft/mi) creates high velocity areas (rapids, cascades, drops, falls and plunge pools). The bottom materials are primarily large boulders and heavy rubble. Downed trees, log jams and other woody material are scattered along the length of the creek. Spawning gravels are found primarily above log jams, in side eddys and at the tail-out of pools.

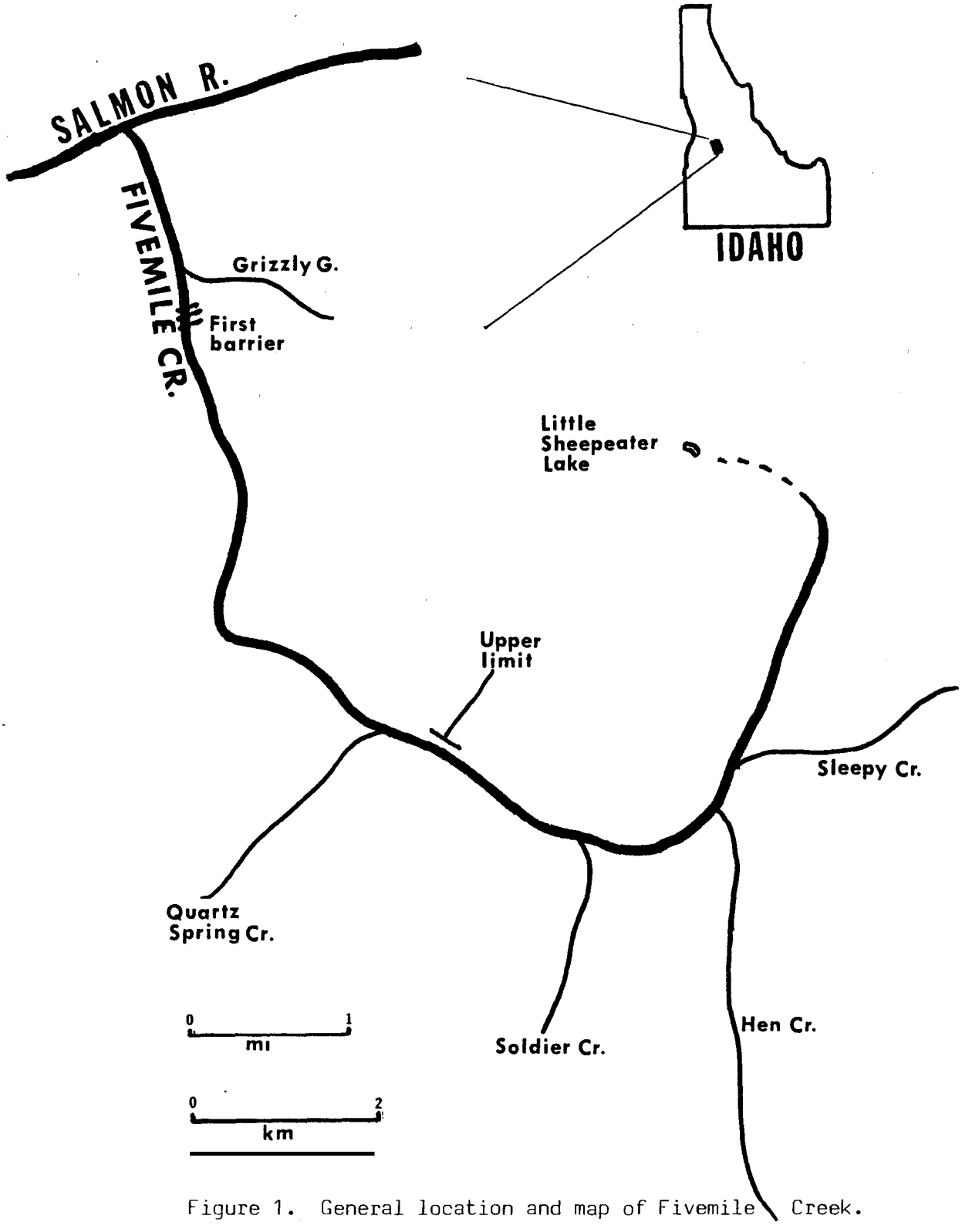

Figure 1. General location and map of Fivemile Creek.

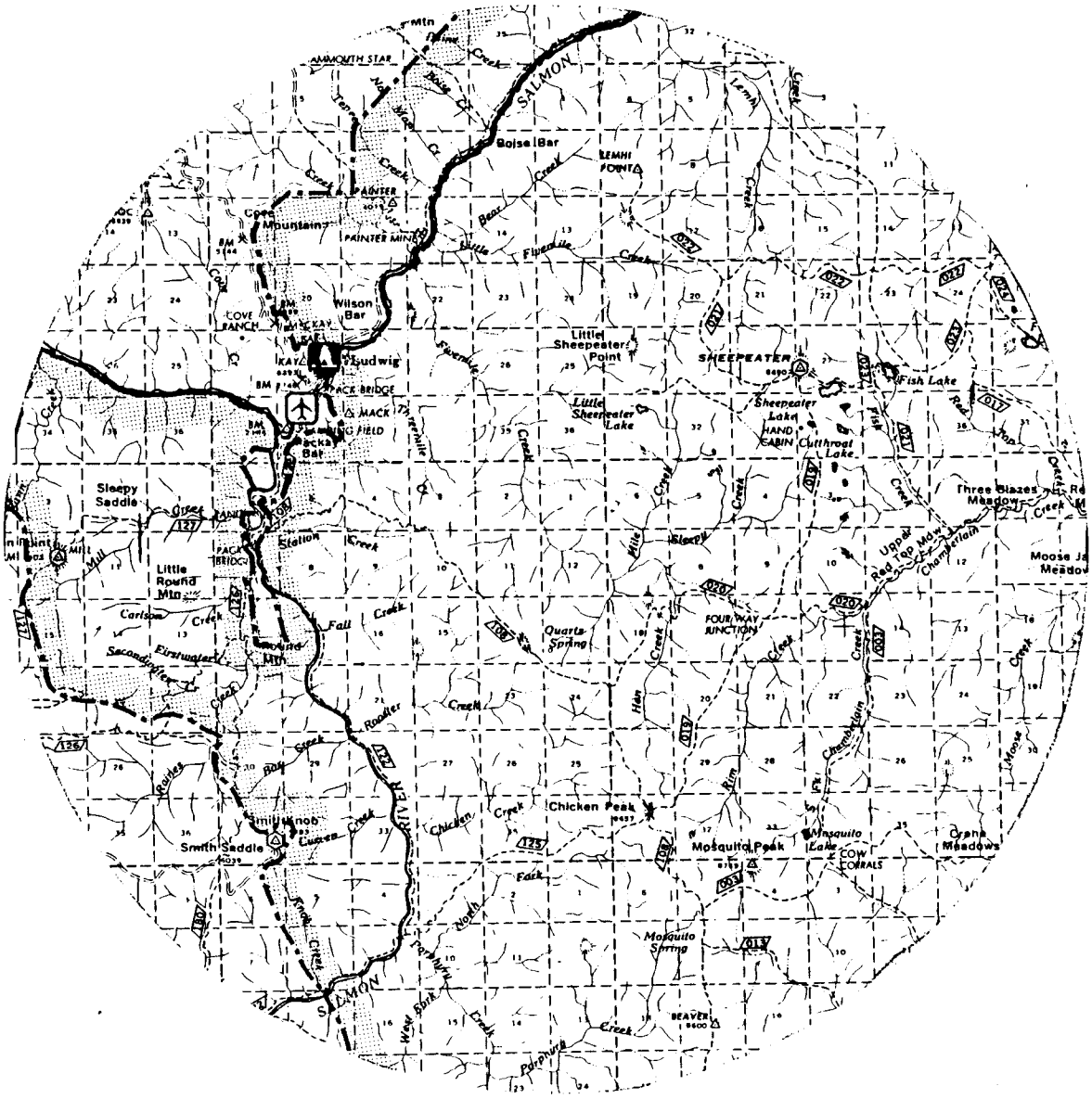

Figure 2. USFS map of Fivemile Creek area, Frank Church River-of-No-Return Wilderness.

Along the lower. 6.5 km (4 mi) of the stream, a number of active slide areas (major and minor) are presently contributing boulders, rubble, sediments and trees to the creek. These areas are affecting and changing some of the existing barriers in the creek.

The remote location of Fivemile Creek, its small size and difficult access are undoubtedly the reasons why this isolated rainbow population was not recognized until the 1980's. Most streams in the Chamberlain Basin area have received introductions of nonindigenous fish stocks either by direct stocking, by infiltration from alpine lakes or are accessible by fish from the Salmon River. No records, written or oral, indicate that outside stocks were ever planted in Fivemile Creek.

Little Sheepeater Lake (at its headwaters) had received aerial plants of cutthroat intermittently in past years. The lake, however, is too shallow to support fish over winter and no fish were found in the lake in 1985. Stocking records are unclear, but it appears it was last stocked in the late 1960's by pilot Bill Dorris of McCall, flying for the defunct Johnson Flying Service. The lake has no over-surface outlet and fish could not escape from the lake.

METHODS

The field survey conducted in 1985 was the initial investigation made to determine the general situation concerning the Fivemile Creek rainbow population and the drainage itself. The difficulty of access to the area is demonstrated by the logistics involved to conduct this survey.

On July 23, I took the Department of Fish and Game's whitewater jet boat from Corn Creek to Lemhi Bar on the Salmon River and remained overnight with Bob Smith, outfitter and guide,at his camp. The morning of July 24, I continued downstream to Fivemile Bar. The boat was then left with the caretakers of "Buckskin Bill's" homestead and I returned upriver with Bob Smith.

On July 29, another man and I flew into Chamberlain Basin landing field from Salmon, Idaho, and met the third member of the investigative party who had flown in from Boise. Ed McCallum, outfitter and guide (Chamberlain Basin Outfitters), met us at the airstrip as arranged and pack mules and riding horses were used to transport us and our equipment to the head of the Fivemile Creek drainage. The trip took six hours.

We then embarked cross-country on foot, carrying our supplies and equipment on our backs to Little Sheepeater Lake. From this point, it took 27 hr over a 3 1/2 day period to traverse the length of the stream. (Average forward speed was .36 mph.) When we emerged at the mouth of the creek on August 1, we used the jet boat moored there to return upriver to Corn Creek where a vehicle had been parked.

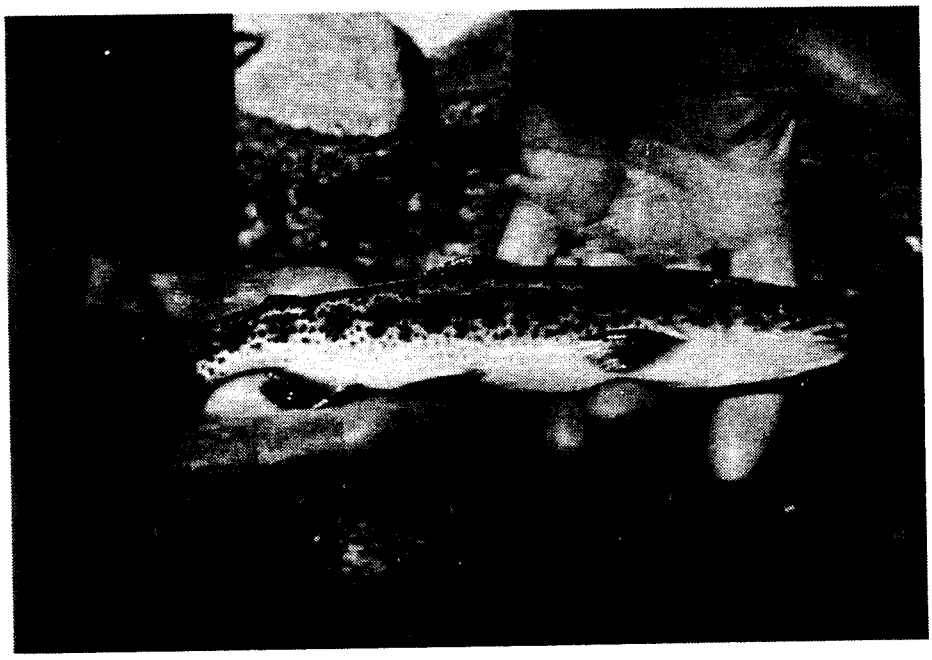

Figure 3. Typical Fivemile Creek rainbow trout.

During the traverse .of Fivemile Creek, we used angling gear to collect fish from the creek (Fig. 3). We measured all fish caught to the nearest 10 mm increment and collected scales from representative length groups. Fish were cut open and inspected for gonad development to determine age at maturity. These fish also supplemented our diet of freeze-dried food.

A wet suit, snorkel and mask were used to make underwater counts and observations of fish in five pools above the lower barriers on August 22, 1985.

On November 4, we collected 52 rainbow-steelhead trout, near the mouth of Fivemile Creek with a Cofelt backpack shocker for additional electrophoretic analyses. Seven fish had been collected by angling gear on September 20.

The electrophoretic analyses of rainbow samples collected from Fivemile Creek were conducted by Dr. Fred W. Allendorf and Robb F. Leary of the Department of Zoology, University of Montana, Missoula, Montana. Two groups of fish were analyzed: (1) one sample of 48 individuals collected by angling gear above the lower barriers on September 21, 1984, and (2) a group of 59 fish collected near the mouth of Fivemile Creek on September 20 and November 4, 1985. The protein extraction procedures and electrophoretic methods followed those described by May et al. (1979). Data were compared to that compiled on other Salmon River and Northwest stocks by prior research work (Milner and Teel 1979; Milner, Teel and Utter 1980; Wishard and Seeb 1983; Milner and Teel 1985).

Mr. Robb Leary also compared five bilateral meristic physical characteristics of the upper rainbow sample to fish from Macks and Sinker Creek (redband trout) from two tributaries of the Snake River in Owyhee County, Idaho.

RESULTS AND DISCUSSION

Little Sheepeater Lake

Little Sheepeater Lake is approximately five surface acres in size, with an average estimated depth of less than 2.4 m (8 ft). The bottom is thick mud and sediments, with few rocks or boulders showing and little vegetation. This lake does not appear capable of supporting fish over winter, and no fish were present in the lake on July 29, 1985. The lake has no inlet stream: several small springs, seeps and snowmelt provide inflow. The outlet of the lake flows only a few meters then sinks underground into a large boulder patch. There appears to be no route for fish to escape from the lake. Salamanders were present.

Although aerial stocking of cutthroat trout occurred in the 1950's and 1960's, they obviously did not establish themselves in the lake. No cutthroat trout were observed or caught in Fivemile Creek during our survey.

Fivemile Creek

As we proceeded down Fivemile Creek above Quartz Spring Creek, we made visual observations and fished on a periodic basis. We were unable, however, to remain continually in the stream due to its small size, gradient and obstructions, such as trees. On the afternoon of July 30, (the second day) we noted the presence of a waterfall-cascade area at the confluence of Hen Creek. A large pool at the base of these falls was devoid of fish. Because of the gradient and impassable conditions instream at that point, we proceeded along the canyon sides. Thick vegetation forced us higher into a large rockslide in order to continue our descent of the drainage. We could hear what sounded like a high-gradient falls area near the mouth of Soldier Creek, but could not see the stream at that point. The next place we approached the creek was approximately 450 m (500 yd) below Soldier Creek. We could view the stream from the hillside, but could not readily enter It. We continued along the east hillside and eventually were able to re-enter the creek approximately .5 km (1/3 mi) above Quartz Spring Creek. At this point, we saw the first fish. The lateness of the day, threatening weather and the lack of a suitable camping site persuaded us against returning upstream to locate the absolute upper limit of the fish population. We believe, however, we were within a few hundred meters of the upper barrier; its location lies approximately .8 km (.5 mi) above Quartz Spring Creek or approximately 6.4 km (4 mi) upstream from the lowermost barrier in Fivemile Creek.

From the Quartz Spring Creek area, we traveled downstream in the stream bed. We noted the presence of several boulder falls that appeared to be impassable barriers (Figs. 4 and 5). There were no obvious high water routes around these, and it appeared that higher flows would increase velocities and make passage even less likely. Fish were above these barriers, however.

A possible explanation for the presence of fish above upper barriers may be related to the presence of landslides. We noted a number of areas along the drainage where massive amounts of boulders, rocks, trees, rubble, gravels and sand had slid and were actively sliding into Fivemile Creek. This material can inundate, fill and modify a falls-cascade area, allow fish passage and then be moved out by high flows. An observable demonstration of this occurred in 1983.

Oral history related by Sylvan "Buckskin Bill" Hart (through caretaker Mark Haney in 1982) described the presence of a waterfall and large plunge pool approximately 2.6 km (1.5 mi.) upstream from the mouth of Fivemile Creek. Buckskin Bill noted this falls from his earliest trips up Fivemile Creek in the 1930's and named the location "The Pothole". In late October of 1983, a few days before the major Idaho earthquake near Mackay, caretaker Mark Haney noted a deep rumbling and felt earth movement at the homestead site. Two days later, he traveled up Fivemile Creek to go fishing in "The Pothole." When he arrived there, he did not recognize the area and was unable to find "The Pothole." Climbing on some large angular boulders, he claimed he was nearly crushed as something shifted and moved under him. Inspection of the area in 1984 disclosed that a

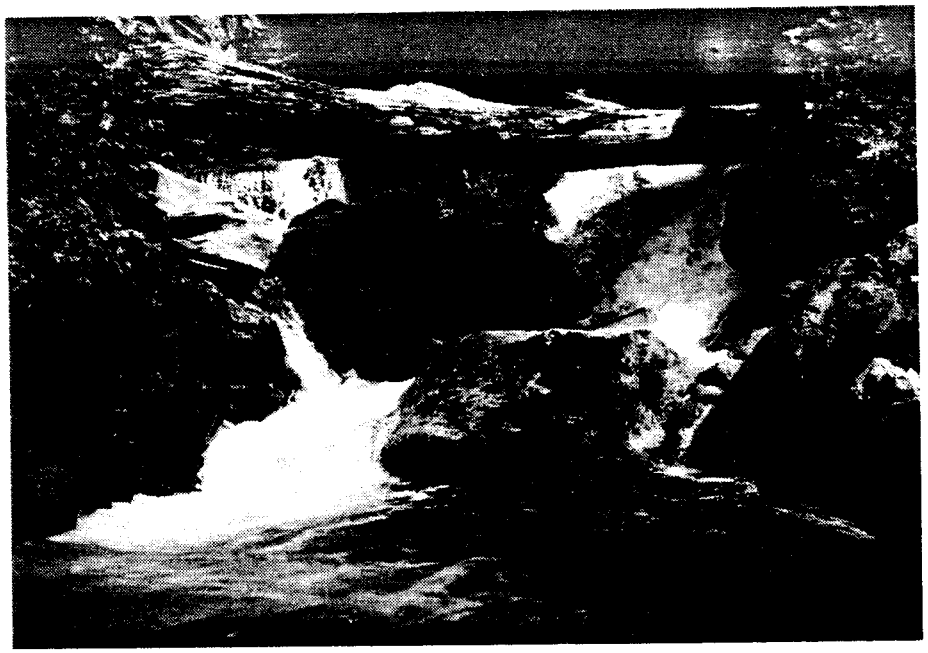

Figure 4. Boulder falls located in Fivemile Creek below Quartz Spring Creek.

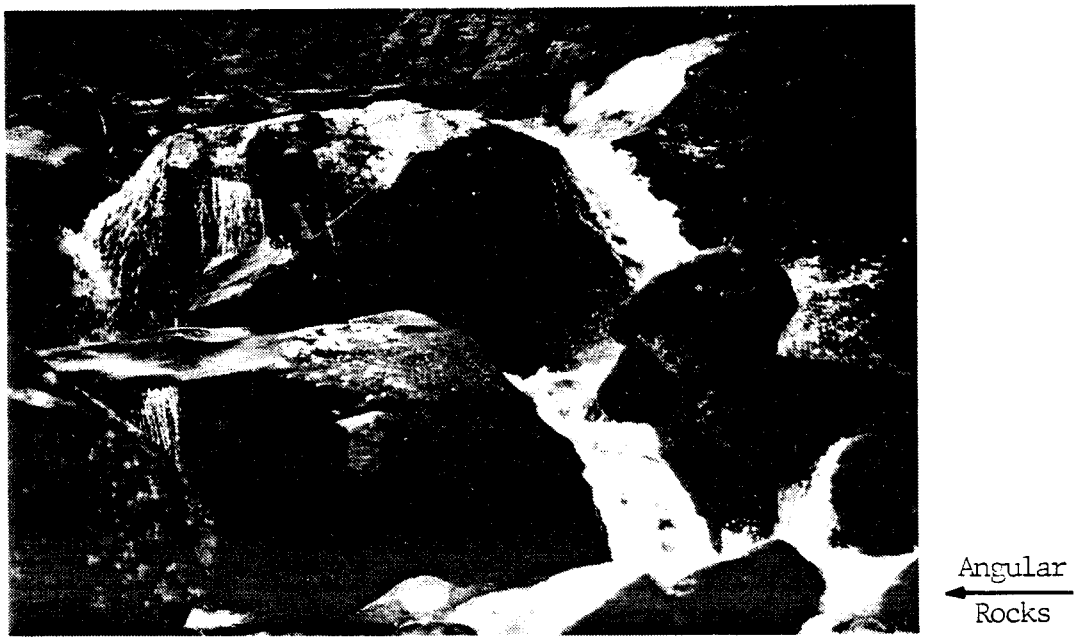

Figure 5. Typical, apparently impassable barrier area. Note angular rocks in foreground.

massive slide had obliterated and filled the area, the falls no longer existed and the area no longer appeared to be impassable to fish. Photographs of the area before and after the slide are shown in Figures 6 and 7. Undoubtedly, this material will shift and move downstream for many years. It is possible a barrier may re-establish itself in time. Also, the primary barrier area lies a few hundred meters below this deposition and it could possibly be affected by materials moving downstream.

In some of the upper barriers in the creek, we noted the presence of large, angular boulders that appeared different in color and in surface texture from the primary boulders which formed the barriers. I believe these are either recent depositional materials, or heavy boulders left behind from previously washed-out slide materials (Figs. 4 and 5). Geological examination of the stream bed materials could possibly delineate the age of barrier materials.

The initial barrier occurs approximately 2.4 km (1.5 mi) above the mouth of Fivemile Creek, and is comprised of a waterfall approximately 1.8 m (6 ft) high, with a high-velocity chute above (Fig. 8). Above this area, we found only rainbow trout. Below this point, Fivemile Creek contains steelhead trout, chinook salmon, whitefish, bull trout, cutthroat trout, sculpins and suckers. Squawfish may also be present.

Isolated Rainbow Population

In September 1984, we collected 48 rainbow above the lowermost barriers. These fish were taken to the University of Montana at Missoula for electrophoretic analyses. All 48 fish were screened for electrophoretically detectable variation at 47 loci (Table 1). Thirty-eight loci were nonvariable for the common allele in rainbow trout. Genetic variation was detected for nine loci. The rainbow from Fivemile Creek are electrophoretically very different from other rainbow trout populations in the upper Columbia River drainage that have been examined, including those from other nearby Salmon River tributaries (Bargamin, Chamberlain and Sheep) (Table 2). This difference is shown by the dendogram (Fig. 9) based upon genetic similarities between these samples using the variable loci that were analyzed (Gpi2, Ldh4, Mdh3, 4 and Sod1) (Allendorf and Leary 1985). The variant alleles at Gpi2 and Aatl in Fivemile Creek fish are unique to this population. This distinctiveness is most likely the result of a very long period of reproductive isolation.

In the fall of 1985, 59 steelhead-rainbow trout were collected from Fivemile Creek below the barriers (near its mouth). Electrophoretic analyses of the protein products of 48 loci was conducted (Table 3).

Of the 59 fish analyzed, four harbored the null alleles Aatl and Gpi2 that are not known to occur in other rainbow populations except the upper Fivemile. The remaining 55 fish did not show the presence of these alleles. This led to the conclusion that the four fish that possessed the null alleles most likely originated from above the barriers. Due to the lack of these alleles in the lower samples, the rainbow populations above and below the barriers differ and interbreeding between the upper and lower populations is not occurring. Adult steelhead are known to

Figure 6. "The Pothole" prior to October, 1983 rockslide. Note photo point.

* Small vegetation covered hump in lower right of both photos is photo reference point.

Figure 7. "The Pothole" area, summer 1984, completely obliterated by rockfall. Note photo point.

Figure 8. Initial barrier area, approximately 2.6 km (1.5 mi.) above the mouth of Fivemile Creek. Above this point only rainbow trout were found.

Table 1. Enzymes and loci examined in rainbow trout from Fivemile Creek, 1984 and 1985.

Enzyme	Loci	Tissue
Aconitase	Acol,2	L
Adenylate kinase	Adkl,2	M
Alcohol dehydrogenase	Adh	L
Aspartate aminotransferase	Aatl,2	L
	Aat(3,4)	M
Creatine kinase	Ckl,2	M
	Ck3, CkC1,2	E
Glucose phosphate isomerase	Gpil,2,3	M
Glyceraldehyde-3-phosphate dehydrogenase	Gap3,4	E
Glycerol-3-phosphate dehydrogenase	G3p1,2	L
Glycyl-leucine peptidase	G11,2	E
Isocitrate dehydrogenase	Idhl,2	M
	ldh(3,4)	L
Lactate dehydrogenase	Ldhl,2	M
	Ldh3,4,5	E
Leucyl-glycyl-glycine peptidase	Lgg	E
Malate dehydrogenase	Mdh(1,2)	L
	Mdh(3,4)	M
Malic enzyme	Me(1,2)	M
	Me(3,4)	L
Phosphoglucomutase	Pgml,2	M
	Pgml-t	L
6-Phosphogluconate dehydrogenase	6Pg	M
Sorbitol dehydrogenase	Sdh	L
Superoxide dismutase	Sod1	L
Xanthine dehydrogenase	Xdh	L

Note: The protein products of the pairs of loci in parentheses are electrophoretically indistinguishable so they are considered to be single tetrasomic loci in all analyses. E = eye, L = liver, M = muscle.

Table 2. Allele frequencies at nine variable loci in rainbow trout from Fivemile Creek (upper) and three other Salmon River tributaries.

Locus	Allele	Frequency in the Population			
		Five Mile	Bargamin	Chamberlain	Sheep
Aatl	100	0.065 ,	NA	NA	NA
	null	0.935			
Aco2	100	0.604	0.790	0.690	0.750
	90	0.396	0.210	0.060	0.250
	82	--	--	0.250	--
Gpi2	100	0.396	1.000	1.000	1.000
	null	0.604	--	--	--
Idh3,4	100	0.818	NA	0.670	NA
	114	--		0.010	
	71	0.089		0.180	
	40	0.094		0.150	
Ldh4	100	0.646	0.320	0.240	0.290
	120	--	--	0.030	--
	76	0.354	0.680	0.730	0.710
Mdh3,4	100	0.792	0.990	0.980	0.930
	125	0.198	--	0.010	0.010
	83	0.010	.-0.010	--	0.060
	74	--	--	0.010	--
Sod.	100	0.885	0.850	0.960	0.880
	152	--	0.010	0.010	--
	57	0.115	0.140	0.030	0.120

NA = not analyzed

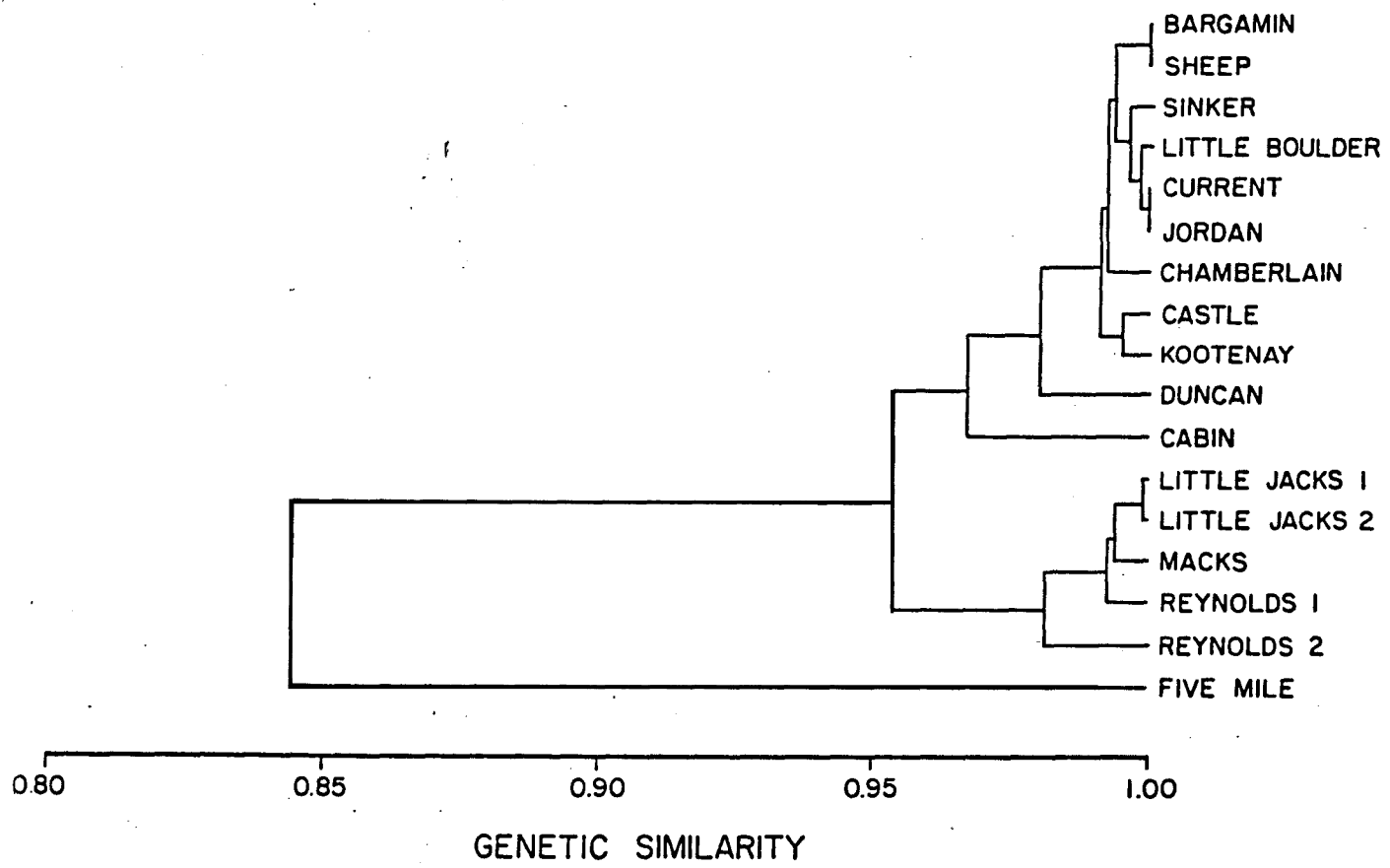

Figure 9. Dendogram of genetic similarity between Fivemile Creek rainbow and 16 other anadromous and nonanadromous rainbow stocks.

Table 3. Allele frequencies at the genetically variable loci in samples of rainbow trout collected above (upper) and below (lower) the first barrier in Fivemile Creek and three other Salmon River tributaries.

		Allele Frequencies				
Locus	Allele	Five Mile (Upper)	Five Mile (Lower)	Bargamin	Chamberlain	Sheep
Aatl	100	0.065	0.907	NA.	NA	NA
	165	--	0.093			
	null	0.935	--			
Aat3,4	100	1.000	0.995	NA	NA	NA
	110	--	0.005			
Aco2	100	0.604	0.787	0.790	0.690	0.750
	90	0.396	0.148	0.210	0.060	0.250
	82	--	0.065	--	0.250	--
Adkt	100	1.000	0.982	NA	NA	NA
	400	--	0.018			
G11	100	1.000	0.973	0.958	0.950	0.975
	115	--	0.027	0.042	0.050	0.025
Gpi2	100	0.396	1.000	1.000	1.000	1.000
	null	0.604	--	--	--	--
Idh3,4	100	0.818	0.591	NA	0.670	NA
	114	--	--		0.010	
	71	0.089	0.291		0.180	
	40	0.094	0.118		0.150	
Ldh4	100	0.646	0.409	0.320	0.240	0.290
	120	--	--		0.030	--
	76	0.354	0.591	0.680	0.730	0.710
Ldh5	100	1.000	0.991	1.000	1.000	1.000
	95	--	0.009			
Lgg	100	1.000	0.991	1.000	1.000	0.991
	135	--	0.009			0.009
Mdh3,4	100	0.792	0.991	0.990	0.980	0.930
	125	0.198	0.005	--	0.010	0.010
	95	--	0.005	--		--
	83	0.010	--	0.010		0.060
	74	--	--	--	0.010	

enter and spawn in lower Fivemile Creek and the 55 rainbow in the lower sample were most likely juvenile steelhead. Further evidence to substantiate this is shown in Table 4. Based on the loci analyzed from lower Fivemile Creek rainbow-steelhead and rainbow-steelhead from nearby Salmon River tributaries (Bargamin, Chamberlain and Sheep), it is apparent there is a closer similarity between these populations than between the fish above the barriers (Fig. 10) (Allendorf and Leary 1986).

Of the fish collected above the barriers in 1984, total counts of five bilateral meristic traits were compared to similar traits in rainbow trout from two tributaries of the Snake River in Owyhee County, Idaho. These trout, commonly referred to as redband trout, have also evidenced a long period of reproductive isolation. Four of the five characteristics examined (mandibular pores, pectoral fin rays, upper and lower gill raker counts) showed significant differences between these fish and the Fivemile rainbow (Table 5) (Allendorf and Leary 1986).

The sample of fish taken from above the barriers that was electrophoretically analyzed showed a relatively high amount of genetic variation. Nine of the 47 loci (18%) were variable. Average heterozygosity of this sample is 0.068. This is high, relative to the other populations of rainbow trout examined from upper Columbia River areas (Allendorf and Leary 1985). This high heterozygosity was unexpected in the isolated Fivemile rainbow. A genetically distinct fish population restricted to one small stream would be expected to lose genetic variation due to a restricted population size. An explanation of this is not readily apparent. One possibility could be that a series of sub-isolated genetically distinct groups exist above several upper barriers. Fish could migrate downstream over these barriers, but no upstream movement could occur. Our sample for electrophoretic analyses was collected at the lower end of the population. Collection and analyses of fish above upper barriers would reveal if that situation exists.

During the July 29 to August 1 survey, we measured 112 fish caught by angling. Total length ranged from 100 to 240 mm (Fig. 11). We also inspected the gonads of 20 trout. Mature ovaries and sperm sacks were found in fish as small as 150 mm.

Scales taken from 52 rainbow above the barrier were read for number of annuli present. The number of annuli found versus sizes of fish were: 100 to 120 mm/I, 120 to 160 mm/Ii, 160 to 220 mm/III, and 200 to 240 mm/IV. Age-length relationships are shown in Figure 12. Based on this data, the fish in Fivemile Creek are sexually mature and capable of reproducing in their third year of life.

The percent of the sample caught and measured by age on the July 29 to August 1 survey is shown in Figure 13. No fish older than 4+ years were caught during the survey.

As has been discussed, the only species that appears to be present above the barriers is rainbow trout, although other species are common below. This situation leads me to believe that the origin of these fish were steelhead. The size and jumping ability of adult steelhead and the

Table 4. Genetic similarities between five populations of rainbow trout from Salmon River tributaries based on loci that were analyzed in all the populations.

	Five Mile (Upper)	Five Mile (Lower)	Bargamin	Chamberlain
Five Mile (Lower)	0.922			
Bargamin	0.917	0.988		
Chamberlain	0.901	0.991	0.992	
Sheep	0.918	0.995	0.999	0.990

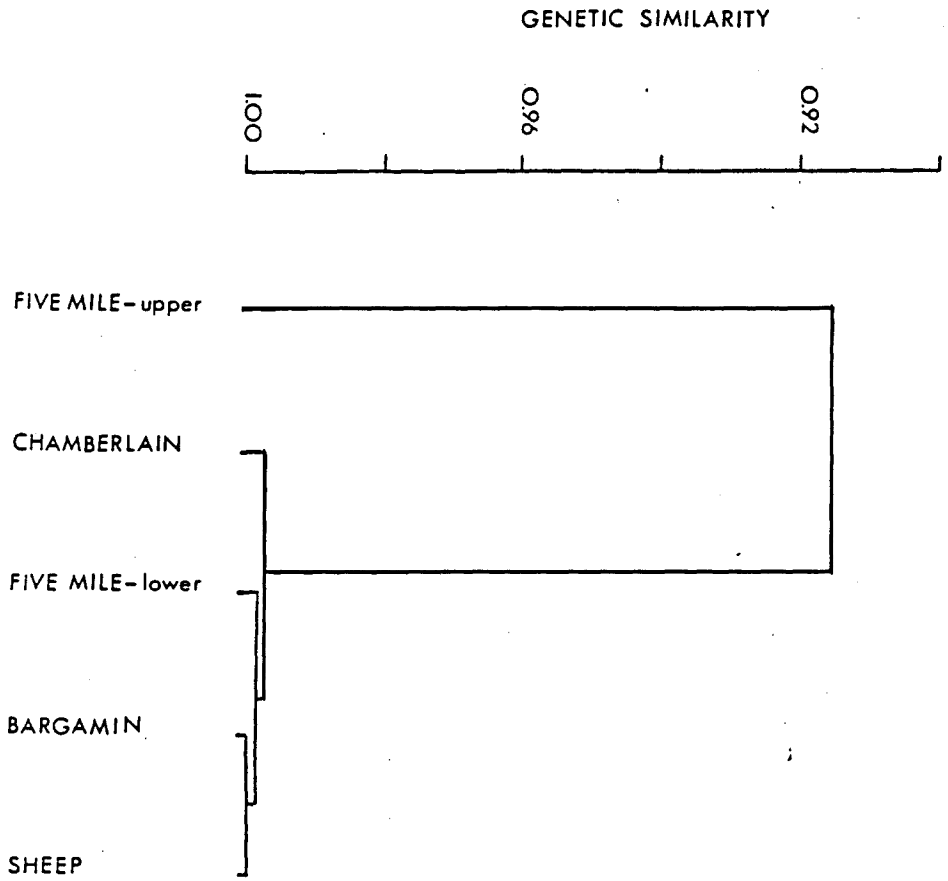

Figure 10. Dendogram of genetic similarity between upper Fivemile rainbow trout and lower Fivemile, Chamberlain, Bargamin and Sheep creeks.

Table 5. Mean and standard deviation (SD) of the total counts of five bilateral meristic traits for rainbow trout from Fivemile Creek and from two tributaries of the Snake River in Owyhee County, Idaho.

	Mean (SD)		
Character	Five Mile	Macks	Sinker
Mandibular pores	15.0(1.3)	16.6(1.6)***	16.1(1.3)***
Pectoral fin rays	28.1(0.7)	27.5(1.2)**	28.2(0.9)
Pelvic fin rays	19.7(1.4)	19.3(0.9)	19.6(1.6)
Upper gill rakers (first arch)	16.6(1.0)	15.3(1.2)***	16.5(1.0)
Lower gill rakers (first arch)	22.0(1.2)	21.3(1.1)**	21.4(1.5)*

Note - Asterisks indicate means that are significantly different from Five Mile Creek: * P < 0.05, ** P < 0.01, *** P < .001.

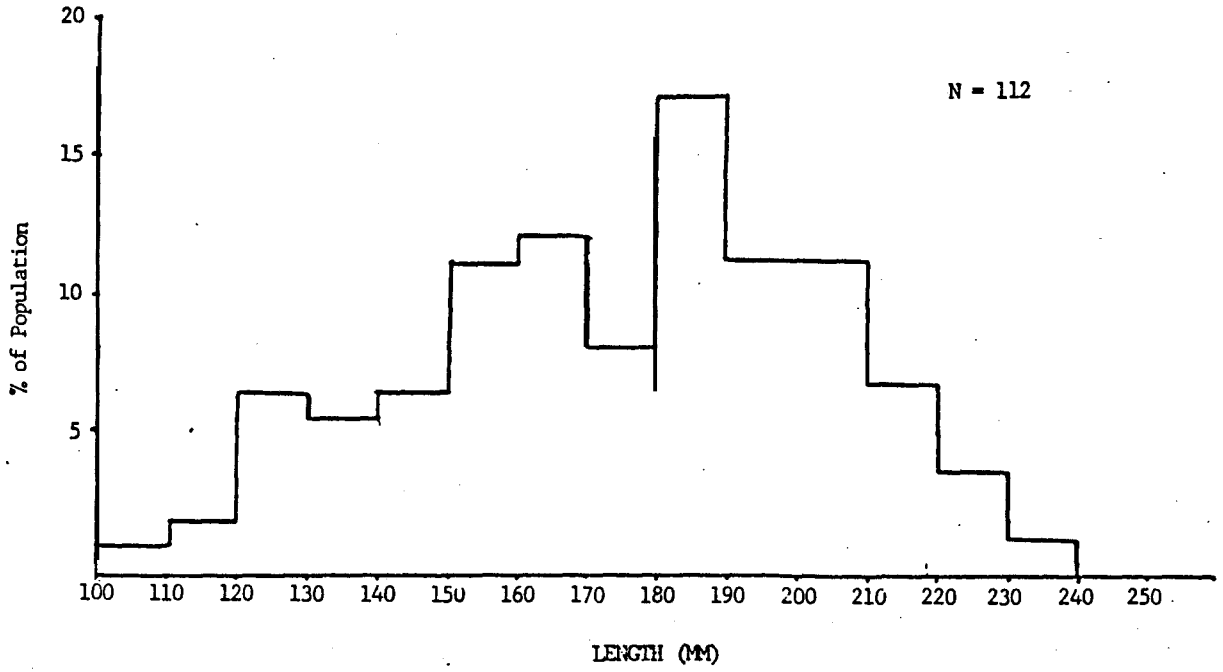

Figure 11. Length-frequencies of 112 rainbow trout caught from Fivemile Creek during the July 29 to August 1, 1985 survey.

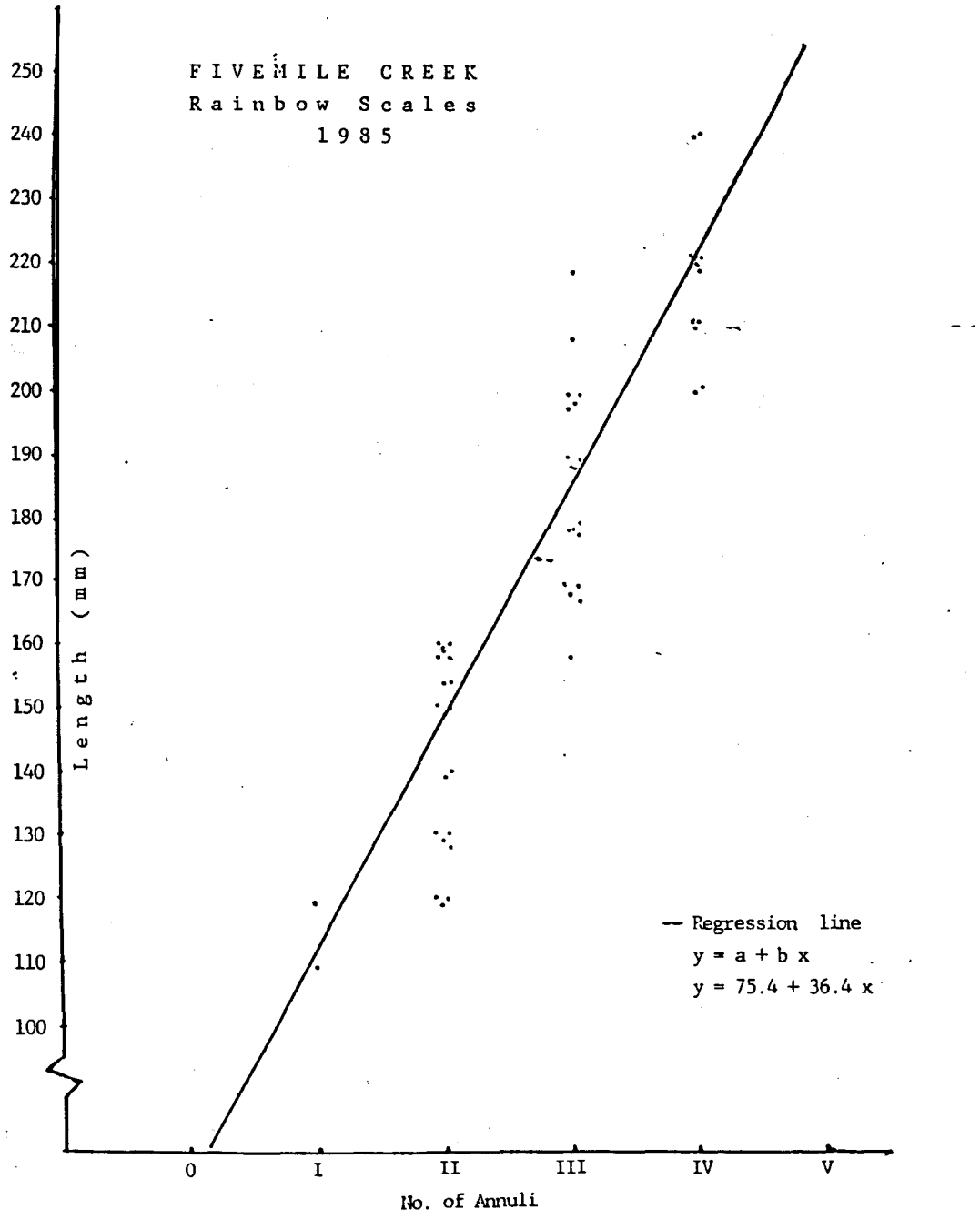

Figure 12. Number of annuli versus length of fish for 52 rainbow trout from upper Fivemile Creek. Sexually mature fish as small as 150 mm total length were found.

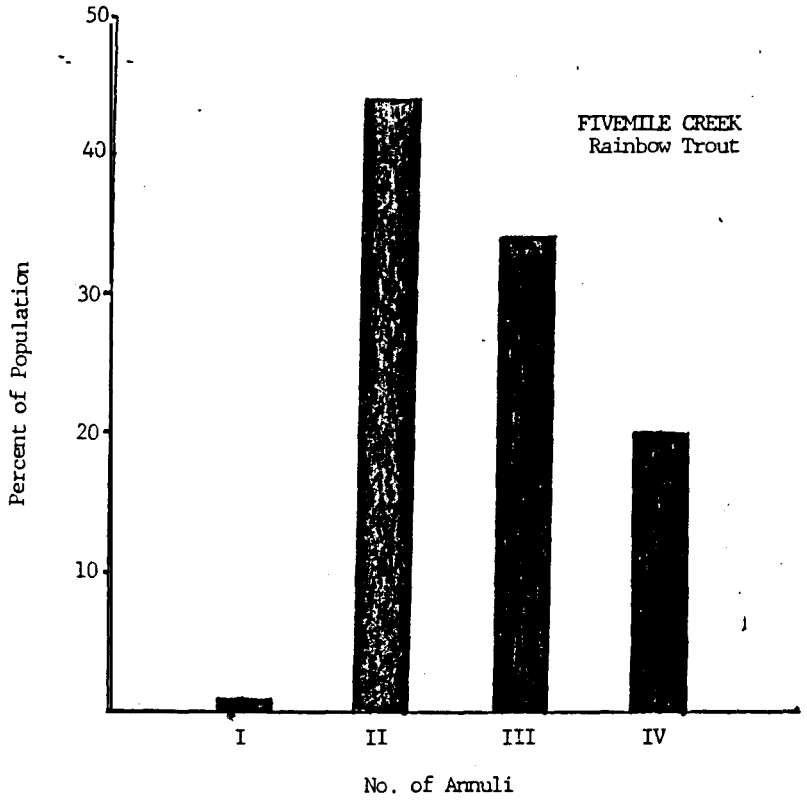

Figure 13. Percent of population caught and measured by age during the July 29-August 1, 1985 survey. Angling gear selected out age-I fish.

fact that their spawning migration timing coincides with spring flows would give them an advantage to ascend the stream that chinook salmon and bull trout would not have at low flows in late summer and fall, when they normally spawn.

I do not believe the present state of the lowermost velocity barriers has allowed passage in recent times and the wide electrophoretic disparity between the upper and lower populations supports this.

It appears that the upper Fivemile Creek rainbow are a unique and valuable genetic resource that deserves recognition and further study.

ACKNOWLEDGEMENTS

The electrophoretic analyses that led to the determination that these fish are truly unique was done by Dr. Fred W. Allendorf and Robb F. Leary of the Department of Zoology, University of Montana, Missoula, Montana.

Virgil Moore, State Resident Fishery Manager, Boise, and Rod Parker, Regional Information and Education Officer, Idaho Falls, Idaho Department of Fish and Game, accompanied me on the five-day field survey of the Fivemile Creek drainage. Their enthusiasm and fortitude is appreciated.

Jim Davis, Regional Fishery Biologist, Idaho Department of Fish and Game, Salmon, assisted in scale reading, data preparation and report review.

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JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-10
Job No.: 6(SAL)-d

Title: Region 6 Salmon Subregion Technical Guidance

Period Covered: July 1, 1985 - June 30, 1986

ABSTRACT

During 1985, technical assistance was provided to all state and federal agencies upon request. Comments were submitted to various agencies and private entities concerning stream alterations, bank stabilization, mining operations and reclamation plans, fish-rearing proposals, private ponds, water withdrawal applications, gravel removal projects, highway reconstruction, bridge replacement and hydropower related matters.

Also, we responded to the general public in person, by telephone and by mail to inquiries about fishing opportunities, techniques, regulations and area specifics.

Author:

Melvin Reingold
Regional Fishery Manager

OBJECTIVES

1. To assist the Department of Water Resources, the Department of Lands, the U.S. Army Corps of Engineers and other state, federal, local and private entities in evaluating the effects of habitat manipulation on fish and fish habitat.

2. To recommend procedures that minimize adverse effects of water course alterations on aquatic habitat and fish.

3. To provide information on all aspects of fisheries and aquatic habitat as requested.

TECHNIQUES

We responded to all requests for data, expertise and recommendations from individuals, government agencies and corporations. Meetings were attended, field inspections conducted and responses generated as appropriate.

RESULTS

During 1985, we responded to requests for technical assistance on various water and fishery related matters as follows:

Agency	Number of requests
U.S. Forest Service	29
Idaho Department of Water Resources	33
U.S. Fish and Wildlife Service	6
Idaho Department of Lands	6
Idaho Department of Highways	9
U.S. Bureau of Land Management	22
Federal Energy Regulatory Commission	8
U.S. Army Corps of Engineers	11
U.S. Bureau of Reclamation	1
U.S. Environmental Protection Agency	4
Private and Miscellaneous	21

We advised four individuals on questions and proposals concerning fish ponds. We responded to a myriad of inquiries from the public about when, where and how to participate in various fisheries in the region, ranging from steelhead angling to high mountain lake fishing. We contributed to the production of a Department-produced "Fishing Guide" to be available to the angling public in the near future.

JOB PERFORMANCE REPORT

State of: Idaho Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-10
Job No.: 6(SAL)-e Title: Region 6 Salmon Subregion Salmon and Steelhead Investigations

Period Covered: July 1, 1985 - June 30, 1986

ABSTRACT

Wild Steelhead Tagging Study

Between September 27, 1985 and March 29, 1986, 466 wild adult steelhead were tagged and released in the main Salmon River from its mouth to Corn Creek (Middle Fork). Fifty-one confirmed recaptures provided information on staging, movement, recatch rates and travel time. It appears that around 12% of the wild steelhead caught and released by sport anglers are caught more than once. This should be taken into account when making population estimates based on catch data.

Wild steelhead stocks staging in the main Salmon River canyon prior to spring spawning migrations are not clearly segregated above and below their target spawning streams. Management schemes relating to mixed-stock fisheries must take this into consideration.

Author:

Mel Reingold
Regional Fishery Manager

OBJECTIVES

1. To gain further knowledge about wild steelhead in the Salmon River and its tributaries.

2. To determine behavioral characteristics of adult wild steelhead trout in the main Salmon River below the Middle Fork.

3. To involve commercial outfitters and guides in the tagging study to mark adequate numbers of fish and to gain their acceptance and support of management schemes and regulations concerning wild steelhead that directly affect their businesses.

RECOMMENDATIONS

Should a study of this nature be repeated in future years, fishing effort (tagging and recapture) should continue into mid-April to maximize information. A mid-April sport fishery should be considered and monitored closely.

BACKGROUND

Since the fall of 1982, adult wild steelhead trout have been protected from harvest in the Salmon River, Idaho. Differential harvest regulations allow the keeping of hatchery-origin steelhead, but wild fish must be released alive and unharmed.

Most wild steelhead in the Salmon River are destined for the Middle Fork and South Fork Salmon rivers and major tributaries in the roadless River-of-No-Return canyon such as Sheep, Bargamin, Chamberlain and Horse creeks. While these wild fish enter the Salmon River in early fall, they stage in the main stem area and do not enter these tributary rivers and creeks to any significant degree until spawning time approaches in the spring (Reingold 1981; Thurow 1983).

In the fall of 1985, I initiated a tagging project to gain knowledge on these wild steelhead concerning migration behavior, travel time, recatch rate, staging information and other behavioral characteristics. Interested and cooperative commercial steelhead fishing guides and ,outfitters operating from the mouth of the Salmon River upstream to Corn Creek (Middle Fork) were recruited to tag steelhead and keep records on recaptures.

For the purposes of this study, the area in which fish were tagged was confined to the main Salmon River from Corn Creek (the terminus of road access to the river from upstream) downstream to its mouth. Most commercial jet boat fishing guides operate in the roadless sections from

Corn Creek to Vinegar Creek (128 km or 80 mi) and from the Whitebird area to the mouth (86 km or 54 mi). Of the total of 466 fish tagged during the project, 440 (95%) were tagged between Corn Creek and Vinegar Creek and 22 (5%) were tagged between Whitebird and the mouth of the Salmon.

Outfitters and guides (commercial steelhead jet boat operators) normally handle the majority of wild steelhead caught and released by their clients. Most are experienced in releasing fish unharmed. Tags were placed on fish that were handled and released during their normal angling activities and no additional angling pressure was brought to bear on these fish for tagging purposes. Tagging was incidental to their standard operations.

METHODS

Adult wild steelhead were marked with an FT-2 dart tag, manufactured by Floy Tag and Manufacturing Company of Seattle, Washington. Tags of various colors and number sequences were used, with the identifying marks located on the free end of the tag, ' to allow the tag to be read without removing it from the fish. The tags were inserted into the back of the fish at the base of the dorsal fin so the single nylon barb engaged one of the dorsal rays internally (Fig. 1). A hollow canulla applicator was used. Application normally took less than five seconds.

Each person tagging fish recorded the tag number and color, the date tagged, the location on the river where the fish was tagged (name of a hole or closest drainage) and the sex and length of the fish. In most cases, a paper punch was used to make a small hole in one operculum and this was noted in a record book. Each tagger was issued a 3 to 111 m Level "Rite in the Rain" pocket-sized notebook with columns labeled for data. Any subsequent recaptures of previously tagged fish were recorded for date and location. All untagged wild fish caught were also inspected for the presence of an opercular punch mark to estimate tag loss.

Informational posters, newspaper articles and check station operations contributed to voluntary tag-return data from the general angling public (Fig. 2).

RESULTS AND DISCUSSION

The steelhead sport fishery on the Salmon River is divided by nature into fall and spring fisheries that are dictated by cold weather and ice formation. The commercial jet boat fishery is particularly affected as frazil ice will not allow the use of jet pumps. The fall fishery generally terminates in mid-November. Commencement of the spring fishery is dictated by spring breakup time (usually late February to early March), which terminates by regulation on March 15 below Mackay Bar and March 31 from Mackay Bar to the Middle Fork.

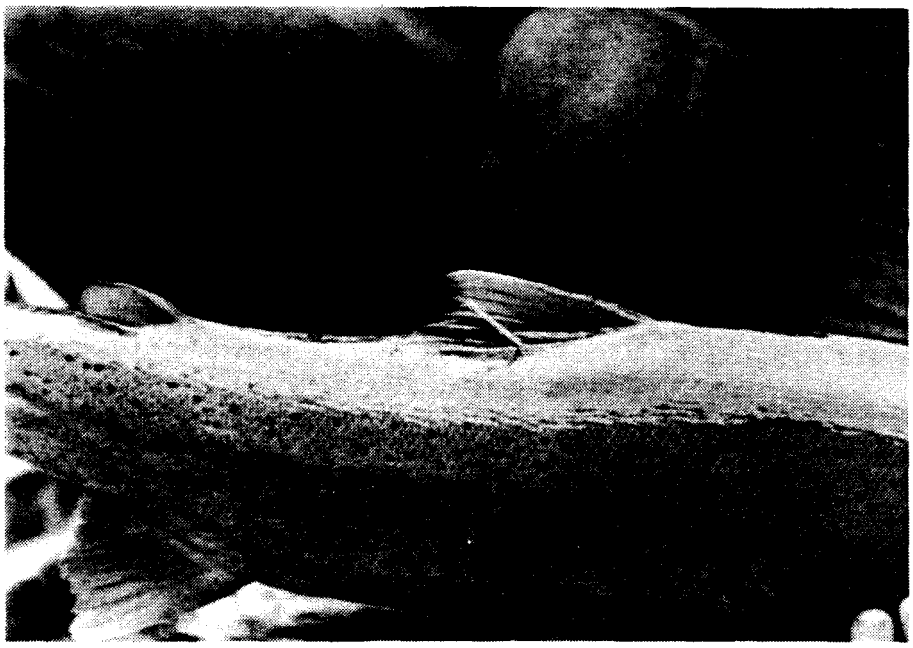
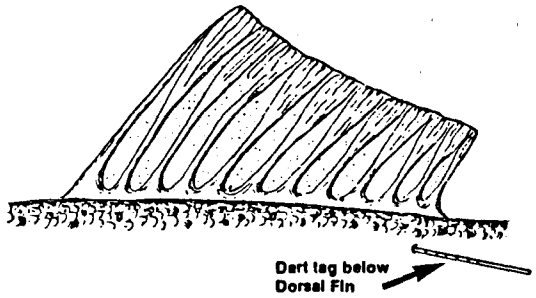


Figure 1. Dart tag in place on an adult wild steelhead.

ANGLERS

TAGGED WILD STEELHEAD IN THESE WATERS



HELP GATHER KNOWLEDGE ON WILD STEELHEAD:

1. Do not remove tag from released fish.
2. Report tag color and number.
3. Report date and location where caught.

TO: Idaho Department of Fish and Game
P.O. Box 1336
Salmon, Idaho 83467
756-2271

OR: Any Fish and Game Officer or any Fish and Game Checking Station

THIS INFORMATION WILL HELP PRESERVE WILD STEELHEAD FOR YOUR FUTURE.

THANK YOU

by order of
Idaho Fish and Game

03-7/85

Figure 2. Informational posters were displayed in angling areas to increase tag returns.

Fall Tagging and Recapture

For the purposes of this project, I divided the tag-recapture data into fall and spring segments. Between September 27 and November 21, 1985, participating personnel tagged 426 wild steelhead on the Salmon River from its mouth upstream to Corn Creek. During this period, there were 31 confirmed recaptures reported (7.3%), of which two recaptures were fish that were recaught twice. Table 1 shows the information on the recaptured fish.

There was a wide range of movement after tagging: 99 km (62 mi) upstream in 27 days to 21 km (13 mi) downstream in 14 days. Days elapsed to recapture ranged from 1 to 31. Two fish (7%) were recaught twice (Fl. Red 111 and Gray 884). Number 111 was recaught 5 days after tagging in the same location and again 31 days later 4.8 km (3 mi) upstream. Number 884 was recaught 3 days and 22 days after being tagged in the same location. It appears this fish remained in the same hole this entire time. Although that particular spot was fished nearly every day, this fish was caught only 3 times during a 22-day period.

Of the 31 recaptures documented, 16 (52%) moved upstream, 6 (19%) moved downstream and 9 (29%) remained where they were. The average elapsed time between tagging and recapture was 13 days. The average distance moved downstream was 6.4 km (4 mi) and the average distance moved upstream was 19 km (12 mi). Average recapture distance from the tagging site was ± 26 km (16 mi).

Of the 426 fish tagged in the fall of 1985, 251 (59%) were tagged below the South Fork Salmon River and 175 (41%) were tagged above. Of the 29 individual fish recaptured, 15 (52%) were fish that were tagged below the South Fork. Of those 15 fish, 12 (80%) were recaught below the South Fork and 3 (20%) above. Of all 31 recaptures (29 individual fish), only 1 was caught above the Middle Fork (Yellow 230).

Based on this data, it appears that wild steelhead entering the Salmon River below the Middle Fork in the fall are not moving great distances, but appear to move into the canyon area and remain in a fairly limited section (average recapture distance was only ± 26 km (16 mi). Most (52%) moved slowly upstream. Average travel time upstream of recaptured fish was .9 km/day (.75 mi).

Spring Tagging and Recapture

Between January 28 and March 29, 1986, participating personnel tagged 40 wild steelhead between Riggins and Corn Creek.During this period, there were also 18 confirmed recoveries of previously tagged steelhead. Of these 18 recoveries, 17 (95%) were from fish that were tagged in the fall of 1985 and one was from a fish tagged in the spring of 1986. Table 2 shows the information on the recaptured fish.

Table 1. Tag–recatch data for 29 wild steelhead on the Salmon River, fall, 1985. All fish were tagged between the mouth and Middle Fork.

Tag description		Date tagged	Tagging location	River mile	Date receught	Recatch location	River mile	Miles[-] from tagging location	Days from tagging location
FL. Red[-]	111	9/27	Nixon Creek	248	10/2	Nixon Creek	248	0 mi.	5
					10/28	Salmon Falls	245	+ 3 mi.	31
Fl. Red	108	10/3	S. Fork Riffle	278	10/17	Below South Fork	278	0 mi.	14
White	424	10/5	Been Creek	225	10/18	Stub Creek	228	3 mi.	13
Orange	029	10/5	Fawn Creek	234	10/24	Lantz	235	– 1 mi.	1–9
Orange	554	10/7	Pine Tree	282	10/29	Ludwig	277	+ 5 mi.	22
Pink	957	10/9	Crooked Creek	287	10/30	Mann's Creek	282	+ 5 mi.	21
Yellow	230-[2/]	10/10	Snag Hole	243	11/6	North Fork	181	+62 mi.	27
Yellow	284	10/10	Blockader	241	10/22	Wheat Creek	224	+17 mi.	12
Blue	627	10/12	Rabbit Creek	287	10/26	Indian Creek	284	+ 3 mi.	14
Green	780	10/12	Bear Creak Bar	249	10/26	White Water	262	-13 mi.	14
Red	389	10/12	California Cr.	292	10/23	Below Calif. Cr.	293	–.5 mi.	11
Orange	562	10/13	Mann's Creek	282	10/29	Pine Tree	282	0 mi.	16
Red	305	10/14	Indian Creek	284	10/30	Below South Fork	278	+ 6 mi.	16
Pink	984	10/14	Sheep Creek	295	10/27	Below South Fork	278	+17 mi.	7
Yellow	258	10/15	Otter Creek	234	10/26	Mo. Middle Fork	218	+16 mi.	11
Orange	568	10/16	Ludwig	277	11/6	Summers Hole	275	+ 2 mi.	21
Red	316	10/17	Pine Hole	286	11/2	Lower Rhett Creek	269	+15 mi.	16
Grey	890	10/18	Devils Tooth	237	10/25	Upper Horse	227	+10 mi.	7
Grey[3/]	884	10/18	Long Hole	247	10/22	Long Hole	247	0 mi.	3
					11/9	Long Hole	247	0 mi.	22
Red	369	10/19	Mo. South Fork	278	10/21	Below South Fork	278	.5 mi.	2
Yellow	206	10/20	Upper Chamberlain	239	10/28	Lower Smith	243	– 4 mi.	8

Table 1. Continued.

Tag description		Date tagged	Tagging location	River mile	Date recaught	Recatch location	River mite	Mites-/ from tagging location	Days from tagging location
Orange	572	10/21	Below South Fork	278	10/29	Ludwig	277	+ 2 mi.	8
Pink	962	10/22	Basin Creek	289	10/30	Basin Creek	288	0 mi.	8
Red	319	10/23	Harlan Hole	280	10/28	Harlan Hole	280	0 mi.	5
Red	356	10/23	Cove Creek	280	10/31	Upper Nixon	248	+32 mi.	8
Grey	889	10/24	Hancock Rapids	250	11/9	Long Hole	247	+ 3 mi.	16
Yellow	271	10/28	Lantz	235	11/18	Fawn Creek	234	+,5 mi.	21
Red	324	11/2	Basin Creek	289	11/3	Basin Creek	289	0 mi.	1
Blue	657	11/3	Flynn Creek	402	11/16	Flynn Creek	402	0 mi.	13

1/ Plus (+) indicates upstream movement, negative (−) indicates downstream movement.

2/ - Yellow 230 was the only reported fish recaught above the Middle Fork.

3/ - Fl. Red 111 and Grey 884 recaught twice.

Table 2. Tag-recatch data for 18 wild steelhead on the Salmon River, spring, 1986. All fish were tagged between Riggins and the Middle Fork.

Tag description		Data tagged	Tagging location	River mile	Date recaught	Recatch location	River mile	Miles from tagging location	Days from tagging location
368	Red	11/08	Partridge Creek	312	3/07	Stub Creek	228	+ 84	119
814	Grey	10/18	Boiler Hole	261	3/22	Bailey Beach	257	+ 4	155
966	Pink	10/11	Elk Creek	294	3/07	Rabbit Creek	287	+ 7	147
730	Green	11/09	Manna Creek	282	3/12	Manna Creek	282	0	- 123
351	Red	10/11	Basin Creek	289	3/15	Crooked Cr.	287	+ 2	124
582	Orange	10/04	Harlan Hole	280	1/29	Legend Creek	229	+ 51	117
282	Yellow	10/28	Legend Creek	229	1/28	Legend Creek	229	0	91
396	Red	10/19	Mackay Bar	278	1/28	Legend Creek	229	+ 49	101
775	Green	11/10	Painter Bar	275	3/13	Middle Fork	217	+ 58	123
956	Pink	10/05	Whiskey Bob Cr.	290	3/15	Spring Creek	197	+ 93	161
789	Green	10/22	Bailey Beach	256	3/24	Pahsimeroi R.	126	+130	153
445	White	10/29	Fawn Creek	235	4/15	Paheimeroi R.	126	+109	168
254	Yellow	10/26	Horse Creek	228	3/22	Middle Fork Mo.	217	+ 11	147
595	Orange	10/04	S. Fork riffle	278	3/22	Middle Fork Mo.	217	+ 61	169
638	Blue	10/24	Manna Creek	282	3/29	Middle Fork Mo.	217	+ 65	156
325	Red	11/09	Whiskey Bob Cr.	290	4/23	Rapid River		– 41	165
357	Red	03/15	Vinegar Creek	300	4/25	Rapid River		– 31	41
214	Yellow	10/24	Smith Gulch	243	5/02	South Fk. +22	278	– 57	190

Range of movement varied from 91 km (57 mi) downstream to 208 km (130 mi) upstream between time of tagging and recapture. Two fish tagged in the fall of 1985 and one tagged in the spring of 1986 were recaptured downstream from the tagging site in the spring of 1986. Elapsed days from tagging date to recapture ranged from 41 to 190. Two fish displayed no movement between tagging and recapture. Number 282 was recaught 91 days after tagging at Legend Creek and number 730 was recaught 123 days after tagging at Manns Creek.

Of the 18 steelhead recaptured in the spring fishery, 3 (17%) were caught above the MFSR (956, 789 and 445). Of these three fish, two were trapped at the Pahsimeroi River Steelhead Collection Facility. These two fish appeared to be wild, however, with no fin deformities or other indications of hatchery origin.

Of the 18 individual fish that were recaptured in the spring of 1986, 10 (56%) were fish that had been tagged below the South Fork. Of those 10 fish, 5 (50%) were recaught below the South Fork and 5 (50%) were caught above.

Combined Tagging and Recapture

Between September 27, 1985 and March 29, 1986, a total of 466 wild adult steelhead were tagged and released between the mouth of the Salmon River and the Middle Fork. As of April 15, 1986, there were 44 (9.5%) confirmed sport fishery recaptures of tagged fish. Seven other incomplete or unconfirmed reports were also received. Unreported recaptures are also likely. The 9.5% recapture ratio is considered to be a minimum figure. If the seven incomplete reports are included, a known sport fishery recapture rate of 10.9% is indicated. If an additional 20% was unreported, a sport fishery recapture rate of 12.8% is indicated.

Of the total 466 fish tagged, 268 (59%) were tagged below the SFSR. Of the 44 individual fish recaught in the sport fishery, 23 (52%) were fish that were tagged below the South Fork. Of those 23 fish, 15 (65%) were recaught below the South Fork and 8 (35%) were recaught above.

Of the total 466 fish tagged, 198 (42%) were tagged between the South Fork and Middle Fork. Of the 44 individual fish recaptured in the sport fishery, 21 (48%) were fish that were tagged in that area. Of those 21 fish, 17 (81%) were recaught below the Middle Fork and 4 (19%) were recaught above.

No steelhead tagged above the SFSR were recaught below the South Fork in the sport fishery. One, however, was recaught in the SFSR field spawner survey. Approximately 1/3 of those tagged below the South Fork, and subsequently recaught, were recaught above the South Fork. Approximately 20% of the steelhead tagged and recaptured between the South Fork and the Middle Fork, and subsequently recaptured, were recaptured above the Middle Fork. No wild fish were reported recaught with an opercle punch and no tag present, indicating that tag loss was not significant.

Tributary Observations

Between April 14 and 19, approximately 60 man-hours were spent making visual observations and angling for steelhead in the MFSR and its tributaries, Loon Creek and Big Creek. Fifteen steelhead were hooked, of which 9 were landed or observed close enough to determine if they were tagged, but none were. Two fish were hooked in Big Creek, none in Loon Creek and 13 in the Middle Fork itself (all below Big Creek).

Between April 17 and May 2, Fish and Game Department personnel surveying steelhead spawners in the SFSR spotted and subsequently caught three adult steelhead with dart tags. These fish were on redds in the Oxbow area, approximately 35 km (22 ml) upstream from the mouth of the South Fork. Two steelhead caught on April 23 and April 25 carried dark red tags. Although the fish escaped before the numbers could be recorded, tags of that color were applied only by outfitters in the fall of 1985, between the South Fork and Vinegar Creek. These two fish had tags applied on opposite sides of their dorsal fins and were identified as two different individuals in that manner.

On May 2 an adult steelhead carrying tag Yellow 214 was caught in this same area. This fish had been tagged on October 24, 1985 at Smith Gulch, approximately 56 km (35 mi) above the South Fork in the main Salmon River. This fish migrated back downstream to the South Fork, went 35 km (22 mi) up that stream and was actively spawning on a redd when captured. This was the only fish tagged above the South Fork and recaptured below or in the South Fork.

Tagged steelhead Red 325 was tagged on November 9, 1985 at Whiskey Bob Creek, approximately 19 km (12 mi) below the SFSR. Tagged steelhead Red 357 was tagged on March 15, 1986 at Vinegar Creek, approximately 35 km (22 mi) below the SFSR. Both these fish subsequently migrated downstream to the Little Salmon River, went up that stream 8 km (5 mi) and turned up Rapid River and entered the fish trap (3.2 km or 2 mi from the mouth) on April 23 and 25 (Table 2).

CONCLUSIONS

Although the project was conducted for only one season and data are somewhat limited, indications are that:

1. A significant proportion of wild steelhead caught below the South Fork in the fall sport fishery are destined for upriver spawning areas.

2. South Fork bound steelhead appear to be in-river below the South Fork in the fall and overwinter there.

3. Probably at least 12% of the wild steelhead population In the Salmon River canyon is caught and released more than once. (This must be considered when estimating population size.)

4. A proportion (20% in 1985 to 1986) of the wild steelhead between the South Fork and Middle Fork are destined for upriver spawning areas above the Middle Fork.

5. After entering the Salmon River canyon in the fall, wild steelhead in general show relatively little movement and remain in a fairly limited area until spring migration to spawning grounds.

6. Although steelhead remain in certain holes that are heavily fished, most are not consistently recaught and may ignore tackle presented to them for long periods of time.

7. Some steelhead wintering in the Salmon River canyon between the Middle Fork and the South Fork are South Fork fish and these return downstream to enter the South Fork to spawn in the spring.

8. Wild Rapid River-origin steelhead stage in the main Salmon River above that tributary stream in the fall and return downstream to enter Rapid River in the spring.

9. Obviously, wild steelhead stocks staging in the main Salmon River canyon prior to spring spawning migrations are not clearly segregated above and below their target spawning streams. Management schemes relating to mixed-stock fisheries must take this into consideration.

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